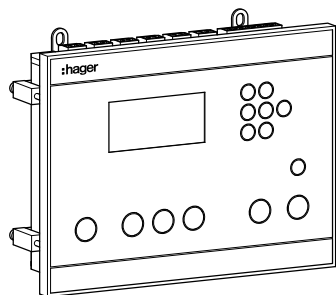


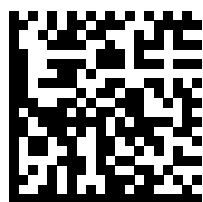
EN Automatic Transfer Switching Controller

Instruction manual





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HZI855



<http://hgr.io/r/hzi855>

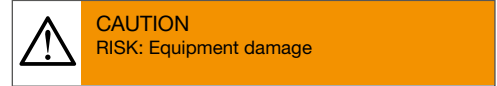
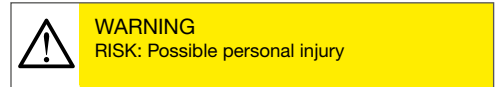
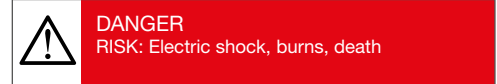
Index

1. General Safety Instructions	4
2. Standards	4
3. Introduction	4
4. General overview	5
5. Environmental	6
5.1. IP Rating 	6
5.2. Operating Conditions	6
5.2.1. Temperature	6
5.2.2. Hygrometry	6
5.2.3. Altitude 	6
5.3. Storage Conditions	6
5.3.1. Temperature	6
5.3.2. Hygrometry	6
5.3.3. Storage duration period	6
5.3.4. Storage position	6
5.3.5. Volume and shipping weights	6
6. Standard compliance and marking	6
7. Mounting and cabling the controller	7
7.1. Product dimensions (dimensions in mm.)	7
7.2. Mounting	7
7.2.1. Door mounting	7
7.2.2. Backplate mounting	8
7.3. Terminal Connections	10
7.3.1. Power Supply	12
7.3.1.1. Dual Power Supply / Sensing	12
7.3.1.2. DC Power Supply	12
7.3.1.3. Command circuits	13
8. First power up - Smart Wizard	15
9. Visualisation options	18
10. Operation and control	22
10.1. HMI use	22
10.2. Navigation Menu	23
10.3. Operating modes	23
10.4. Availability conditions	24
10.5. Test operating mode	26
10.6. Control Menu	26
10.7. Log Menu	27
10.8. Genset scheduler / Engine Exerciser Menu	29

11. Configuration	31
11.1. Configuration through the display	31
11.1.1. NETWORK parameters menu	32
11.1.2. DISPLAY parameters menu	37
11.1.3. TIMERS parameters menu	38
11.1.4. I/O parameters menu	39
11.1.5. COMMUNICATION parameters menu	40
11.1.6. ALARMS parameters menu	41
11.1.7. PASSWORDS	43
11.1.8. SPECIFIC FUNCTIONS Menu	44
11.1.9. Maintenance Menu	45
12. Maintenance	47
12.1. About the controller	47
12.2. Faults management and Troubleshooting	48
12.3. Maintenance of the controller	49
13. Annexes	50
13.1. Annex I: Wiring Diagrams	50
13.2. Annex II: Timers list	52
13.3. Annex III: Inputs list	54
13.4. Annex IV: Outputs list	56
13.5. Annex V: Technical characteristics	57
13.6. Annex VI: Full menu architecture	59
13.7. Annex VII: Communications table	65

1. General Safety Instructions

- This manual provides instructions on safety, connections instructions on the HZI855 ATS controller.
- Whether the HZI855 is sold as a loose product, as a spare, in a kit or as part of an enclosed solution or in any other configuration, this device must always be installed and commissioned by qualified and experienced personnel, in line with the manufacturers recommendations, following good engineering practices and after having read and understood the details in the latest release of the relative product instruction manual.
- Maintenance on the product and any other associated equipment including but not limited to servicing operations must be performed by adequately trained and qualified personnel.
- Each product is shipped with a label or other form of marking including rating and other important specific product information. One must also refer to and respect markings on the product prior to installation and commissioning for values and limits specific to that product.
- Using the product outside the intended scope, outside Hager recommendations or outside the specified the specified ratings and limits can cause personal injury and/or damage to equipment.
- This instruction manual must be made accessible so as to be easily available to anyone who may need to read it in relation to the use, installation or maintenance of the HZI855.
- The HZI855 meets the requirement for the IEC 60947-6-1 standard for transfer switching equipment and the IEC 61010-2-201 standard for control equipment; the product includes the labels and marking with details on each standard.
- No covers on the HZI855 should be opened (with or without voltage) as there may still be dangerous voltages inside the product such as those from external circuits.
- **Do not handle any control or power cables connected to the HZI855 when voltages may be present on the product directly through the mains or indirectly through external circuits.**
- Voltages associated with this product may cause injury, electric shock, burns or death. Prior to carrying out any maintenance or other actions on live parts in the vicinity of exposed live parts, ensure that the switch including all control and associated circuits are de-energized.



Refer to the specific references numbers on this document to order the correct products and associated accessories.

The information provided in this instruction manual is subject to change without notice, remains for general information only and is non-contractual.

2. Standards

- HZI855 complies with the following international standards:
 - IEC 60947-6-1 - Transfer switching equipment
 - IEC 61010-2-201 - Control equipment
 - IEC 61010-1 - Electrical safety requirements
 - Annex C of GB/T 14048.11

3. Introduction

HZI855 is compliant to international product standards and is designed specifically for use in low voltage power applications to ensure the safe transfer of a load supply between a normal and an alternate source.

Besides product standards HZI855 is designed to meet IEC 60364 and IEC 61439 installation standard requirements.

HZI855 range of automatic transfer switch (ATS) controllers ensure:

- Safe controls for transfer between a normal and alternate source
- A manufacturer assembled and tested solution
- Intuitive and simple controls
- Quick easy and safe electrical manual operation
- Straightforward installation with effective ergonomics
- A simple and secure control interface
- Easy mounting and smart configuration
- Suitable for indoor and outdoor applications with IP65 gasket - reference HZI501 in accessory.

Glossary:

ATS:	Automatic Transfer Switch
ACB:	Air Circuit Breaker
MCCB:	Molded Case Circuit Breaker
FT:	Fast Transfer
DT:	Delayed Transition
SCPD:	Short Circuit Protection Device
VT:	Voltage Transformer
GND:	Ground
I/O:	Inputs/Outputs
RTC:	Real Time Clock
S1:	Source 1
S2:	Source 2

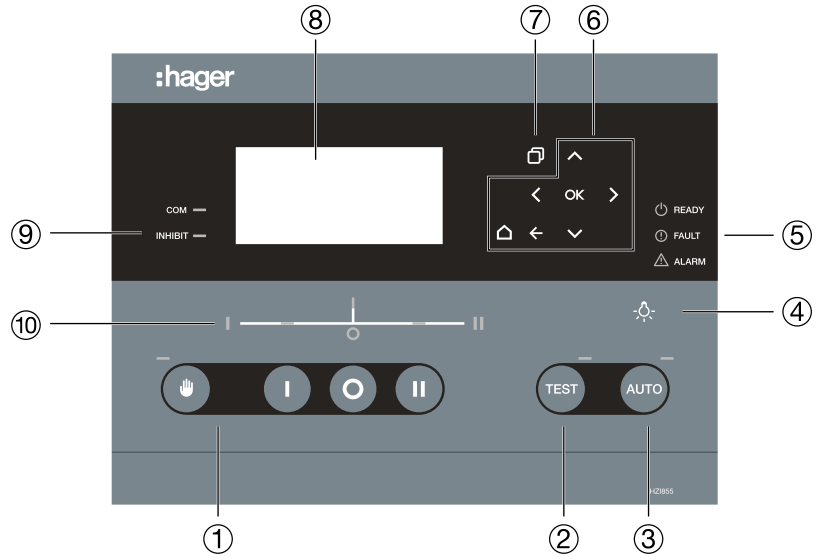
4. General overview

HZI855 ATS Controller reference includes:

- 1 HZI855 Controller
- 1 door mounting kit
- 1 backplate mounting kit
- Quickstarts instruction sheet.

All other components described in this instruction manual are available as accessories and sold separately.

- ① Manual operation buttons and indicator.
- ② Test button and indicator.
- ③ Automatic button and LED indicator.
- ④ Lamp test button.
- ⑤ Power, Fault and alarm LED.
- ⑥ Navigation buttons.
- ⑦ Change dashboard.
- ⑧ LCD display.
- ⑨ LED COM & Inhibit.
- ⑩ Source and switch synoptic.



5. Environmental

HZI855 meets the following environmental requirements:

5.1. IP Rating



- IP65 door mounted with gasket in accessory.
- IP30 door mounted without gasket.
- IP2X on the back of the controller.

5.2. Operating Conditions

5.2.1. Temperature

- From -30 to + 70°C

NOTE: With limitations on the LCD screen that may show temporary distortion below -10°C.

5.2.2. Hygrometry

- 95% humidity without condensation at 55°C.

5.2.3. Altitude



- Up to 2000m

5.3. Storage Conditions

5.3.1. Temperature

- From -40 to + 70°C

5.3.2. Hygrometry

- Recommendation: to be stored in dry, non-corrosive and non-saline atmospheric conditions.

5.3.3. Storage duration period

- Maximum storage up to a period of 12 months

5.3.4. Storage position

- a maximum of 5 boxes may be stacked vertically

5.3.5. Volume and shipping weights

- Volume LxWxH (mm) inc. packaging: 295x255x115
- Weight: net 1.060 kg/ gross 1.500 kg

6. Standard compliance and marking



Lead free
process



Cmim



CE marking

WEEE

- HZI855 is built in accordance with 2012/19/EU directive:



Standards compliance

Certified according to:

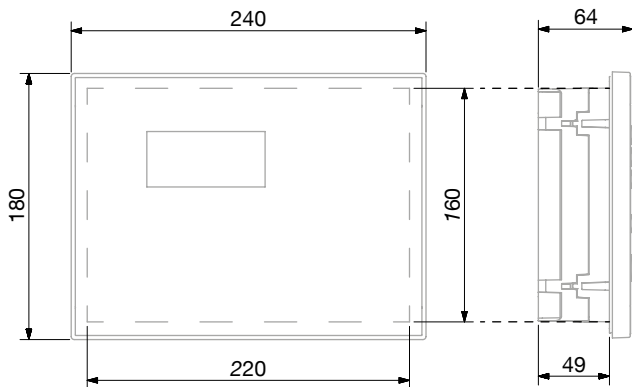
IEC 61010-2-201
IEC 61010-1
GB/T 14048.11 Annex C

Conform to the requirements of:

IEC 60947-6-1 when used with an IEC 60947-6-1 certified RTSE (Remotely operated transfer switch).

7. Mounting and cabling the controller

7.1. Product dimensions (dimensions in mm.)



7.2. Mounting

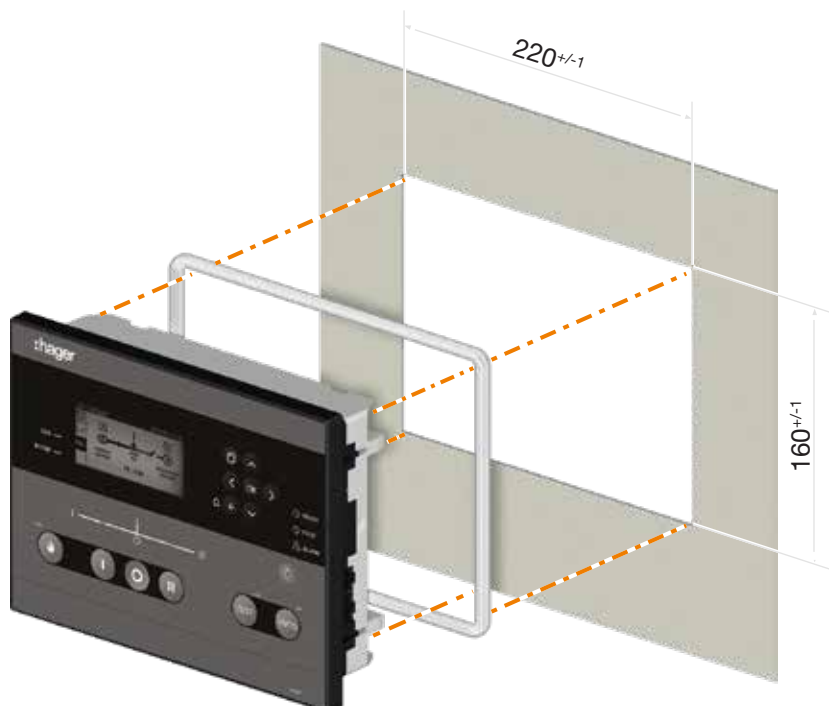
HZI855 can be mounted either on the door or on the backplate of an enclosure (both mounting kits are delivered with the product).

7.2.1. Door mounting

HZI855 can be mounted on doors up to with a thickness 4mm.

STEP 1: Cut out for the controller

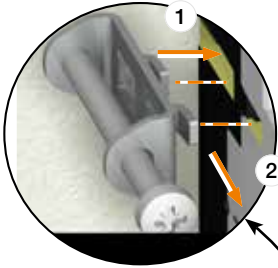
Cut a rectangle hole of 220x160mm on the enclosure door as shown below.



For IP65 protection, the gasket (reference HZI501 in accessory) must be placed and fitted around the inside edge of the controller as shown above.

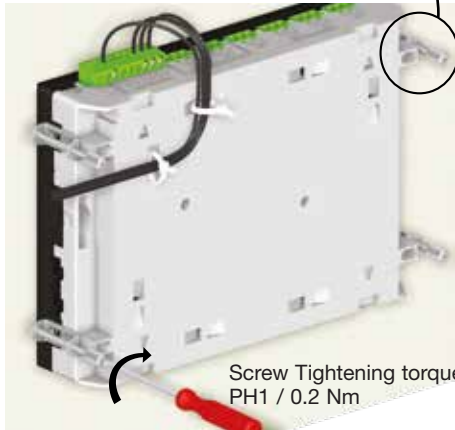
STEP 2: Fixing the controller on the door:

Place the ATS controller inside the door cut-out and clip the door mounting screws into the side of the controller (2 screws on each side). It is important to respect the tightening torque indicated below and follow good engineering practise when installing the ATS controller.



Insert the 4 door mounting screws in the designated slot and push back to lock in place.

Example of cable way

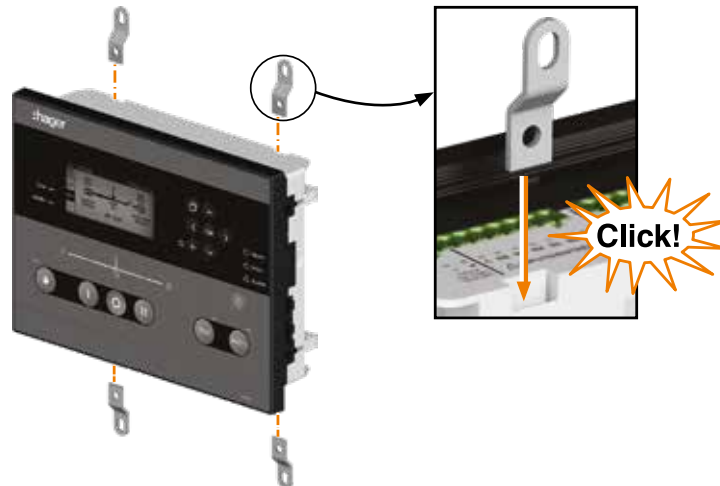
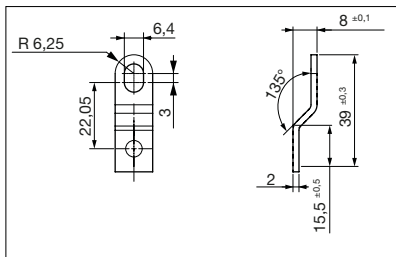


Screw Tightening torque
PH1 / 0.2 Nm

7.2.2. Backplate mounting

STEP 1: Placing the 4 mounting legs on the controller

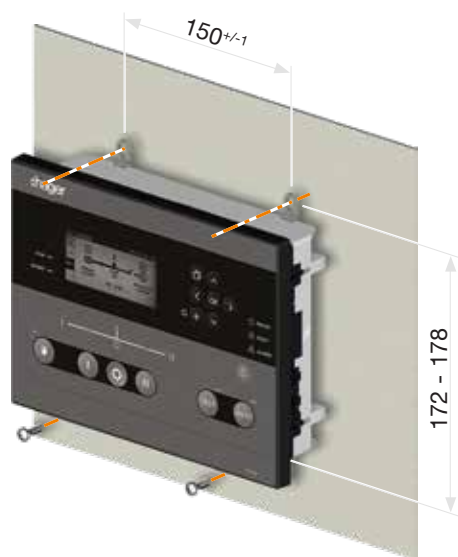
Insert the mounting legs into the 4 slots (2 top side and 2 bottom side (cf below top side view)).



STEP 2: Fixing the controller on the backplate

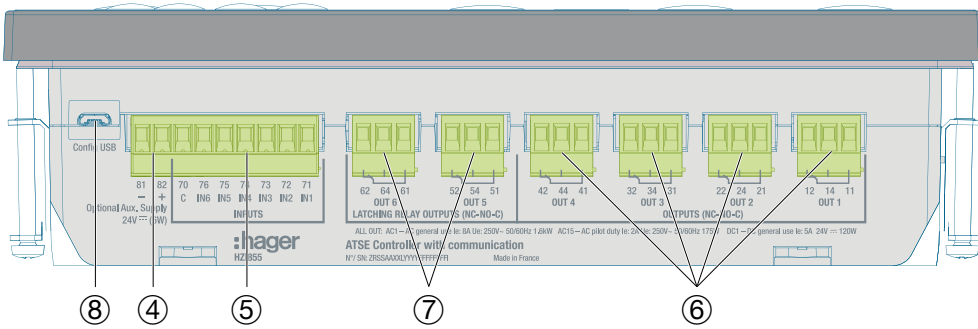
Drill mounting holes in the backplate to match the fixing holes as shown and indicated below.

Fix the controller through the mounting legs to the backplate with a maximum screw diameter of 6mm.

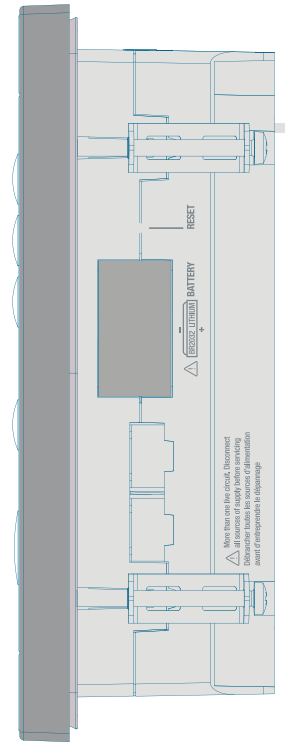


7.3. Terminal Connections

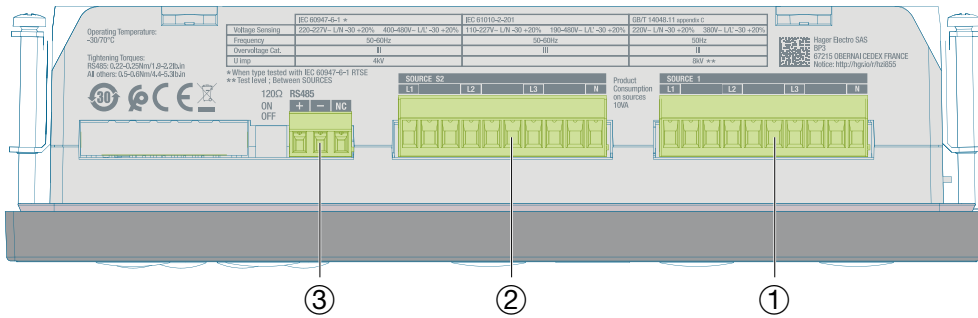
Top view:



Right side view:



Bottom view:



To help secure the control cables during the wiring, the controller includes seven fixing supports on the back of the controller to retain the cables in place using cable ties.

N°	Denomination	Terminal	Description	Characteristics	Recommended Cable Section
①	Voltage sensing source 1	L1 / A	Phase 1 / A	1Ph / 3Ph 50 ... 332 / 575 VAC (50/60 Hz) (+/- 10%) Impulse V. Withstand Test: 6/8 kV* Ui 600V	1 ... 2.5 mm ² Tightening torque 0.5 ... 0.6 Nm
		L2 / B	Phase 2 / B		
		L3 / C	Phase 3 / C		
		N	Neutral		
②	Voltage sensing source 2	L1 / A	Phase 1 / A	1Ph / 3Ph 50 ... 332 / 575 VAC (50/60 Hz) (+/- 10%) Impulse V. Withstand Test: 6/8 kV* Ui 600V	1 ... 2.5 mm ² Tightening torque 0.5 ... 0.6 Nm
		L2 / B	Phase 2 / B		
		L3 / C	Phase 3 / C		
		N	Neutral		
③	RS485	+	DATA + (A)	RS485 bus insulated	Modbus cable 25 m = HTG485H LiYCY shielded twisted pair 0.14 to 1.5 mm ² / Tightening torque 0.22 ... 0.25 Nm
		-	DATA - (B)		
		NC	Ground		
④	Optional Aux. Supply 24 VDC	81	-	12 ... 24 VDC	1.5 ... 2.5 mm ² Tightening torque 0.5 ... 0.6 Nm
		82	+		
⑤	Programmable inputs	70	COMMON	Do no connect to any power supply. To be used with dry contacts	1.5 ... 2.5 mm ² Tightening torque 0.5 ... 0.6 Nm
		71	Input 1		
		72	Input 2		
		73	Input 3		
		74	Input 4		
		75	Input 5		
		76	Input 6		
⑥	Programmable outputs	11-12 NC/ 11-14 NO	Output 1	Do no connect to any power supply. To be used with dry contacts	1.5 ... 2.5 mm ² Tightening torque 0.5 ... 0.6 Nm
		21-22 NC/ 21-24 NO	Output 2		
		31-32 NC/ 31-34 NO	Output 3		
		41-42 NC/ 41-44 NO	Output 4		
⑦	Latching relays	51-52 NC/ 51-54 NO	Output 5		
		61-62 NC/ 61-64 NO	Output 6		
⑧	Config USB	MicroUSB	USB 2.0	USB port can be used for controller power supply when not network connected.	MicroUSB Type B

NOTE 1: Use 7mm as stripping length for the controller terminals.

NOTE 2: Use 90°C copper wire for installations with ambient temperature from 35 to 60°C.
When the ambient temperature is above 60°C, Use 105°C copper wire.

NOTE 3: * Impulse voltage withstand tests at 6kV between phases of the same source and 8kV between phases of a different source.

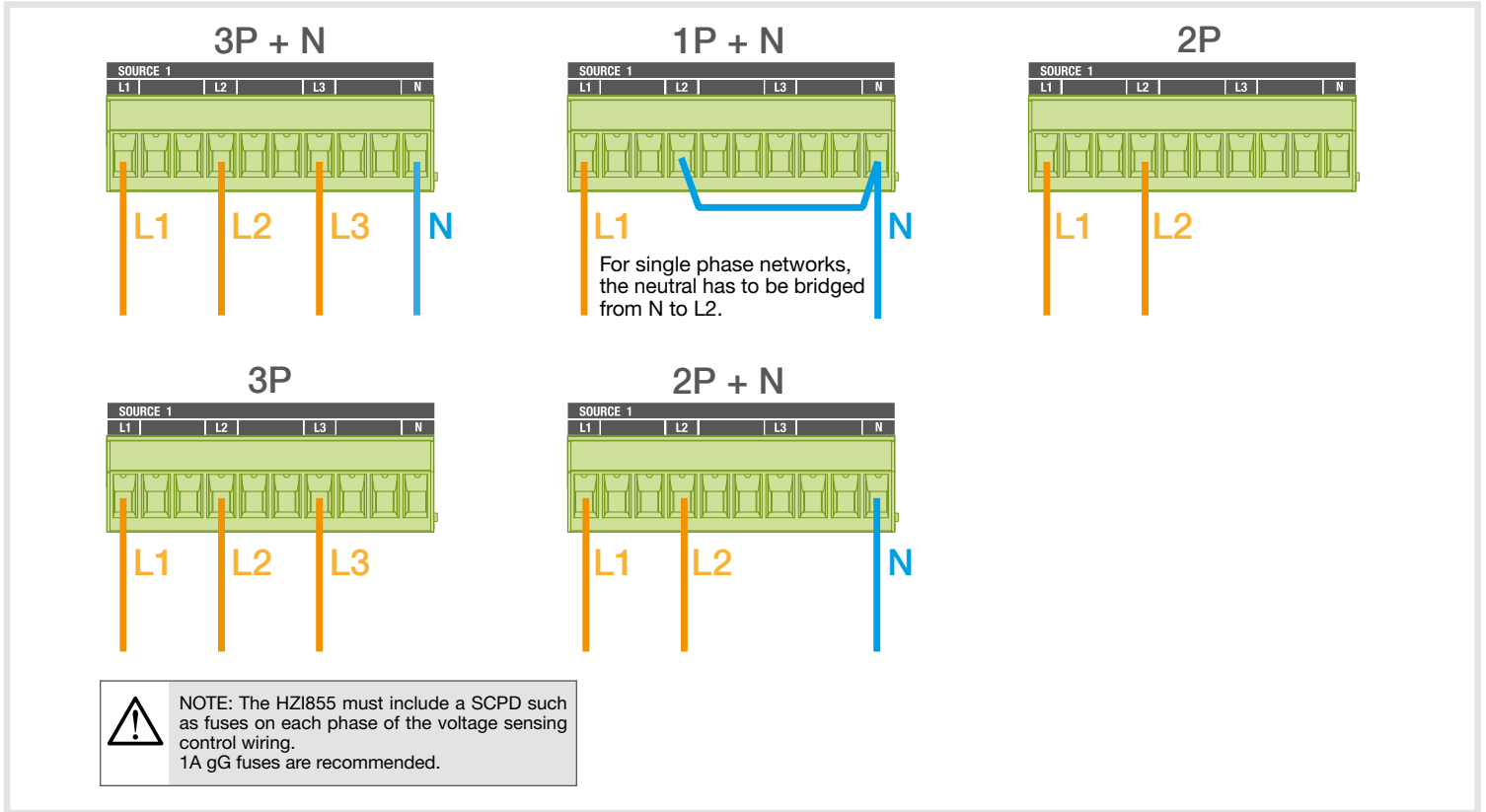
7.3.1. Power Supply

The HZI855 controller is Self-powered from the voltage sensing of any available source, and may also be powered (as a backup from saved source) from the DC auxiliary power input (24 VDC).

7.3.1.1. Dual Power Supply / Sensing

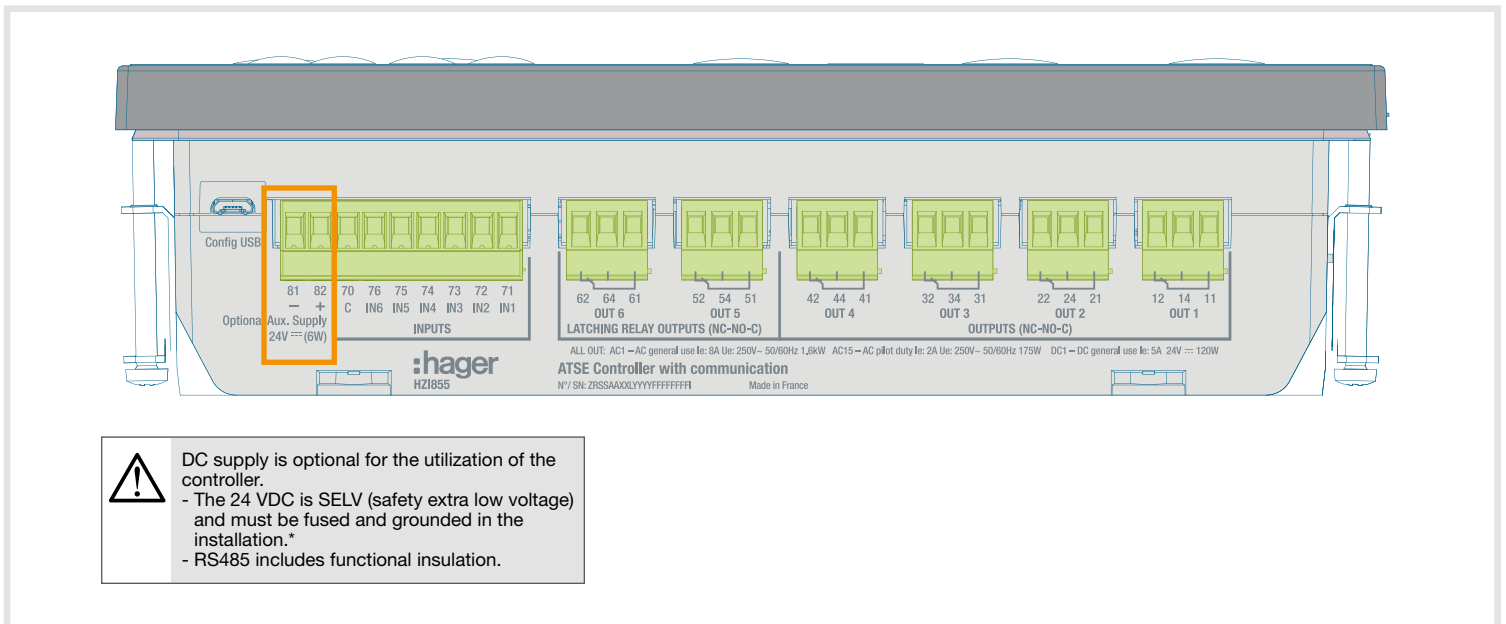
The HZI855 controller will be automatically supplied from the voltage sensing connectors of both sources thanks to an internal DPS (dual power supply) module that in case main source failure, will immediately switch to the secondary source supply the device.

NOTE: The nominal auxiliary power supply feeding the sensing terminals must be within the limits of 88 → 576 VAC.

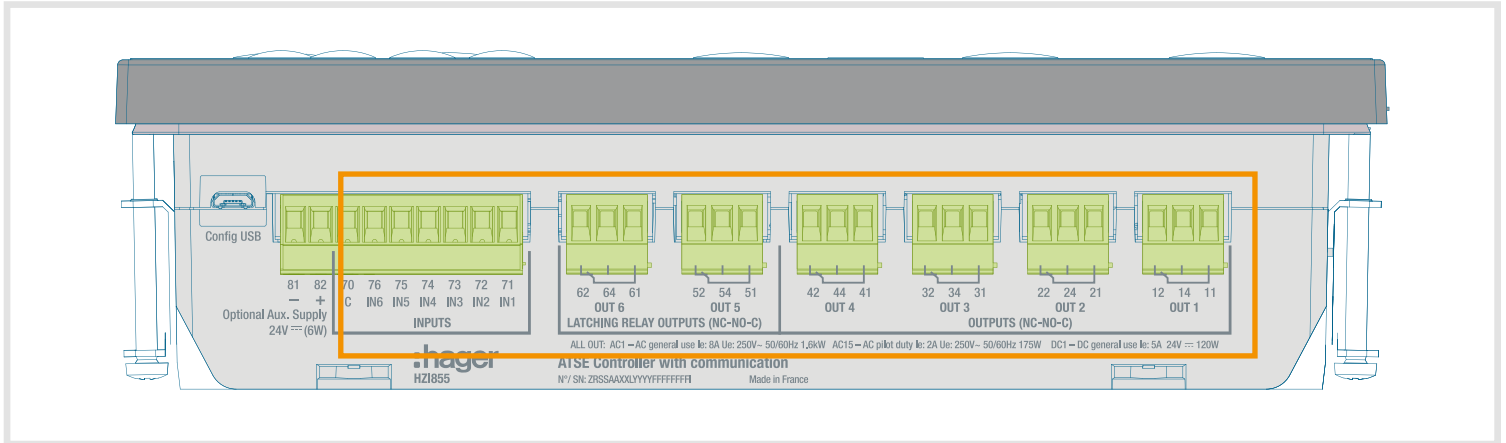


7.3.1.2. DC Power Supply

HZI855 controller includes an optional DC power supply input to power the controller in case both sources are off. The DC power supply voltage needed to power up the controller is between 9 VDC and 28 VDC.



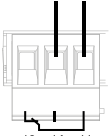
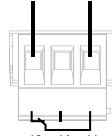
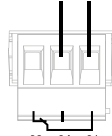
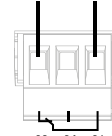
7.3.1.3. Command circuits



By default, the inputs and outputs in the HZI855 are set up as follows:

Type	Terminal N°	Description	By default	Configuration changes when changing RTSE technology	
			Breakers	HIB4xxM	Contactors
Inputs	71	IN1: programmable input	Breaker 1 is in position ON	Switch is in position 1	Contactor 1 is in position ON
	72	IN2: programmable input	Breaker 2 is in position ON	Switch is in position 2	Contactor 2 is in position ON
	73	IN3: programmable input	Breaker 1 is in position OFF	Switch is in position 0	-
	74	IN4: programmable input	Breaker 2 is in position OFF	Inhibit	-
	75	IN5: programmable input	Breaker 1 is in position TRIP	Manual retransfer	-
	76	IN6: programmable input	Emergency stop	RTSE in manual	-
	70	Common point for inputs			
Outputs		Logic	Impulse	Impulse	Maintained
	12/14/11	OUT1: programmable output	Order to close Breaker 1	Order to switch in position 1	Order to close Contactor 1
	22/24/21	OUT2: programmable output	Order to close Breaker 2	Order to switch in position 2	Order to close Contactor 2
	32/34/31	OUT3: programmable output	Order to open Breaker 1	Order to switch in position 0	-
	42/44/41	OUT4: programmable output	Order to open Breaker 2	S1 Available	-
Latching relays		Logic	Impulse	Impulse	Maintained
	52/54/51	OUT 5: genset start relay/programmable output	-	S2 Available	-
	62/64/61	OUT 6: genset start relay/programmable output	Order to start Genset	Order to start Genset	-

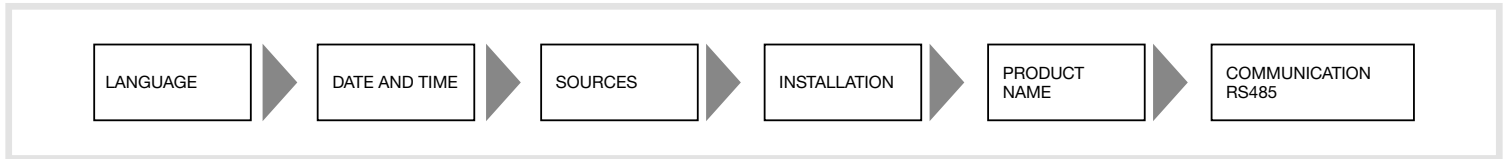
All inputs and outputs can be configured and functions can be changed by going in the Parameters / I/O menu of the controller.
For the cabling, please consider the following table of functioning:

		Cabling Output relays 1-4		Cabling Output Latching relays 5 & 6	
		 12 14 11 OUT 1 Normally Open (NO) (11-14)	 12 14 11 OUT 1 Normally Closed (NC) (11-12)	 62 64 61 OUT 6 Normally Open (NO) (61-64)	 62 64 61 OUT 6 Normally Closed (NC) (61-62)
Controller config	STATE (relay)				
Output configured as NO NO by default	OFF (not active)	Open	Closed	Open	Closed
	ON (activated by firmware)	Closed	Open	Closed	Open
	Controller not supplied	Open	Closed	Closed*	Open*
Output configured as NC	OFF (not active)	Closed	Open	Closed	Open
	ON (activated by firmware)	Open	Closed	Open	Closed
	Controller not supplied	Open	Closed	Closed*	Open*

* HZI855 controller includes two bi-stable relays with backup energy, when the controller loses all sources of power supply outputs 5 and 6 will automatically activate (NO contact will close and NC contact will open). This is a safety feature designed to ensure power availability to the load in Main-Genset or Genset-Genset application by forcing generators to start in case of total power loss. It is highly recommended to configure the outputs 5 and 6 to take benefit from this function.

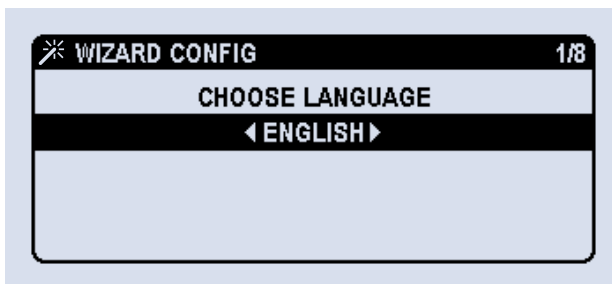
8. First power up - Smart Wizard

Once the controller is connected to the switch with the cable harness, as soon as the controller is powered up, it will automatically start in MANUAL mode and, in order to facilitate the commissioning, a smart wizard will appear to drive the user through the main configuration parameters.



The first out of 8 questions will be the language. User can choose between the following 9 languages:

- English
- French
- German
- Italian
- Polish
- Spanish
- Turkish
- Chinese
- Portuguese



Then it will follow the option to start the wizard with the following options:

- Start now
- Remind me the next power on
- Never ask me again

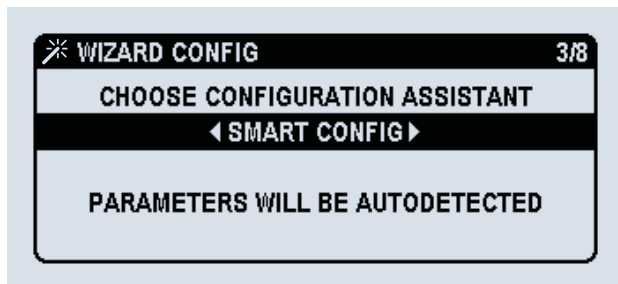
The wizard will always be accessible anyway inside the menu PARAMETERS/WIZARD in case it is missed the first time.



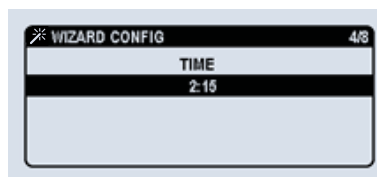
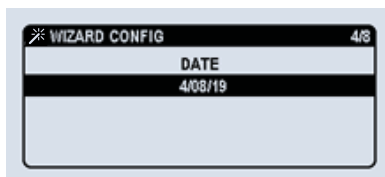
In case the decision taken is to begin with the wizard configuration, then the options are:

- To use the smart configuration: parameters like voltage, frequency and phase rotation will be auto detected and proposed to the user.
- To use the manual configuration: the user needs to enter the values manually.

The controller will require the configurator 4-digit password before the configuration (by default, 1000).

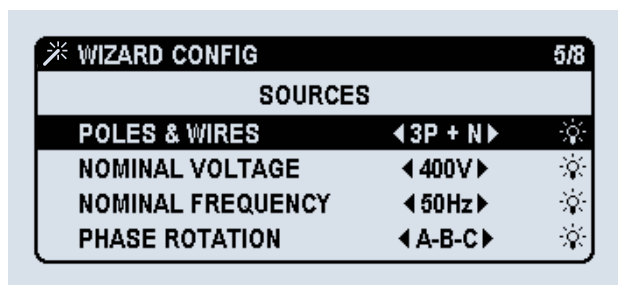


Once the configuration starts, the user needs to enter the date format, date and time as follows:



These time/date values will be saved and from that moment the RTC battery will keep the clock running even if the supply to the controller is lost.

Once these parameters are set, the next step is the sources settings, where the user has to confirm the values proposed by the controller (in case of smart configuration) or enter the values (in case of manual configuration) for the number of poles of the switch / wires coming from the sources, nominal voltage, nominal frequency and phase rotation.



Step 6 is about the installation parameters.

Application type stands for the type of sources coming to the controller. The options are:

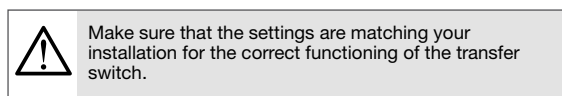
- MAIN - GEN (by default): Power supply coming from a transformer as source 1 and from a diesel generator as source 2.
- MAIN - MAIN: Power supply coming from a transformer for both sources 1 and 2.
- GEN - GEN: Power supply coming from a diesel generator for both sources 1 and 2.

Source priority stands for the preferred source in automatic mode when both sources are fully available.

The options are:

- SOURCE 1: the source connected to source 1 sensing on the switch will become the preferred source and the transfer switch will automatically transfer to this source as long as it is available and the timers are respected.
- SOURCE 2: the source connected to source 2 sensing on the switch will become the preferred source and the transfer switch will automatically transfer to this source as long as it is available and the timers are respected.
- NO PRIORITY: no preferred source. The switch will stay in the same source as long as it is available and will only transfer automatically when it will be lost. In case a source comes back the switch will not transfer automatically as long as the current source is available.

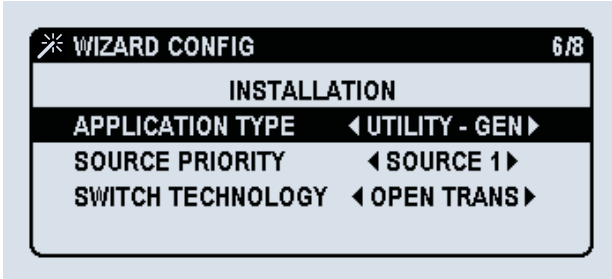
NOTE: It is possible to connect either the transformer or the genset to both source 1 or 2.



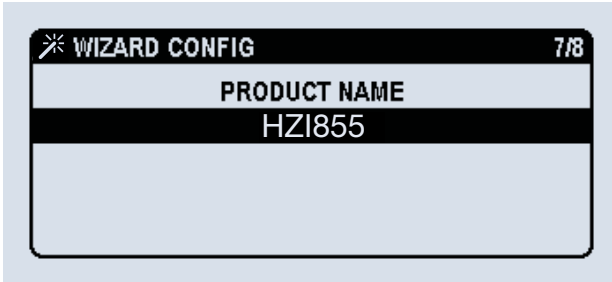
Switch technology stands for the type of switch used with the controller. The options are:

- CIRCUIT BREAKER: to be selected when using 2 separated circuit breakers / air circuit breakers (MCCB or ACB).
- HIB4xxM: to be selected when using a motorized RTSE.
- CONTACTOR: to be selected when using 2 separated circuit contactors.

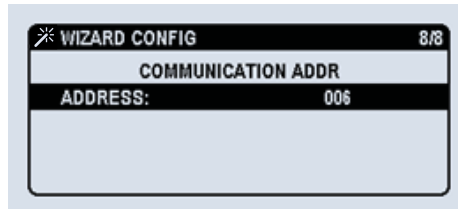
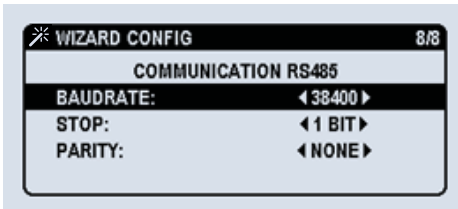
According to this configuration, the INPUTS and OUTPUTS of the controller to pilot the switch and receive the position feedback will be automatically configured to match the application requirements (see values by default in chapter 7.3.1.3. and I/O detail in chapter 11.1.4.) but they can always be modified in the menu PARAMETERS / I/O later on.



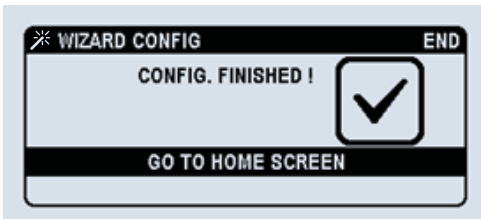
The 7th step is not affecting the functioning of the transfer switch but permits the user to select a name for the product. As default, it's HZI855, but it can be changed for any combination of letters, numbers and signs, for instance, "Cooling", "Line 1" or "DTC/21".



To finalize the configuration, the wizard asks for the communication parameters, such as the slave address (by default 6) and the communication parameters:




After entering and confirming these parameters, the wizard informs that the minimum parameters needed for the transfer switch to work are set and invites to go to the menu home screen where the user can set more parameters and functions manually (see next chapter).

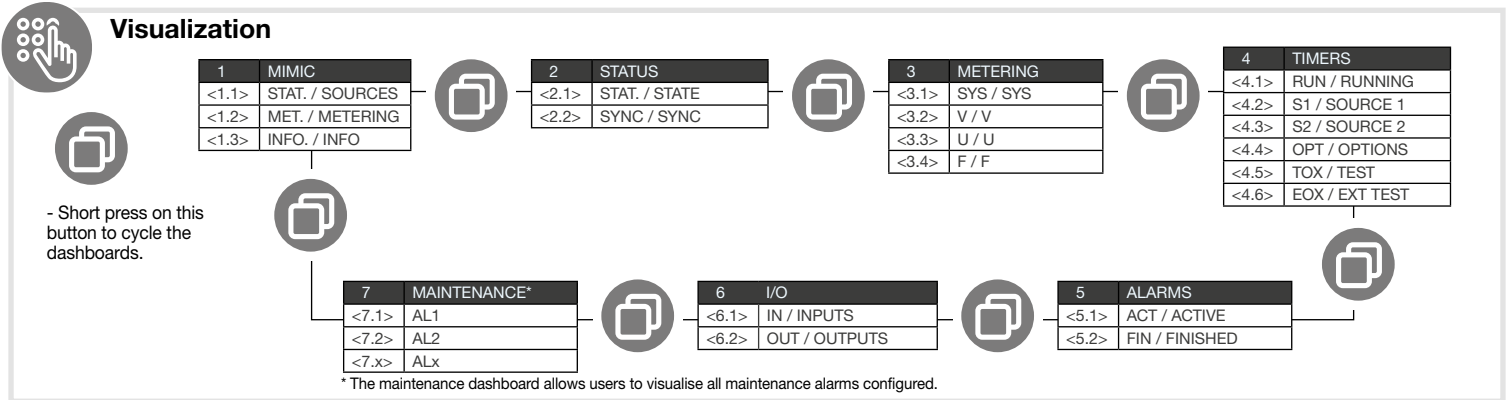


For a detailed configuration please consult chapter 11 (configuration).


9. Visualisation options

The visualisation DASHBOARDS

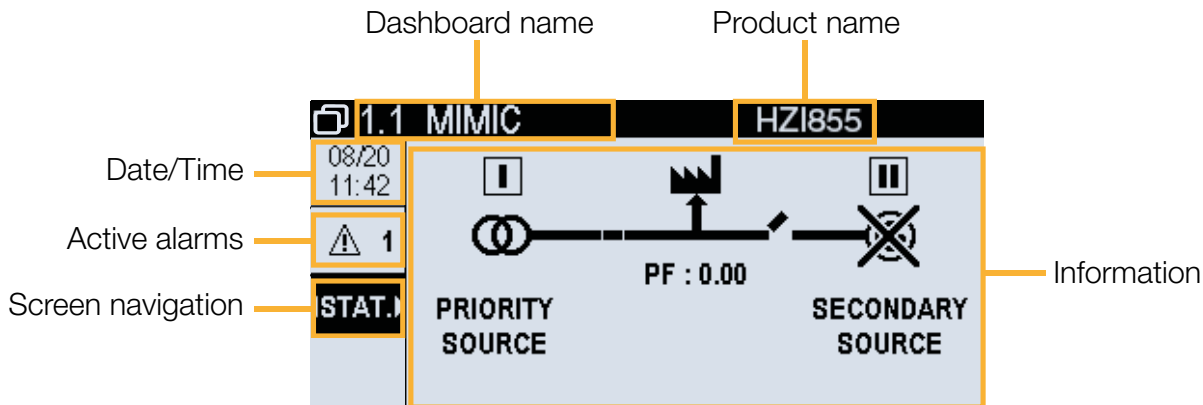
The controller has a direct access button to the visualization dashboards on the front face. The dashboards can be accessed by short pressing the  key. By pressing again we switch from one dashboard to another and inside each dashboard there might be different number of screens as it is shown on the image below. Each dashboard is numbered from 1 to 7 (Ex. 4. TIMERS) and the screens are numbered using a second digit (Ex. 4.1 RUN / RUNNING).



The dashboards can be visualized and screened through without the use of a password.

By pressing the  key it gives direct access to these screens (no matter the current menu screen). This is available only for the screens of the dashboard menu.

All the dashboards have the same display format as follows:

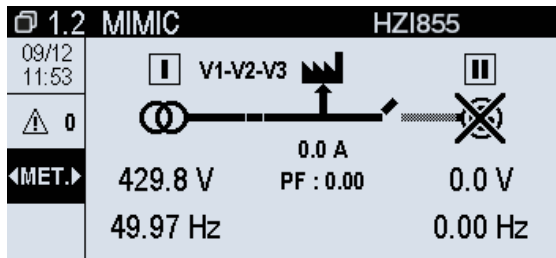
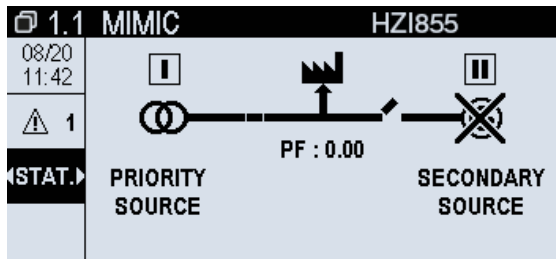


MIMIC: This screen gives the user information on the availability of the sources, the position of the switch. The user can cycle 3 sub-menus using the navigation arrows:

MET.: gives the user information on the voltage, current and frequency of the sources.

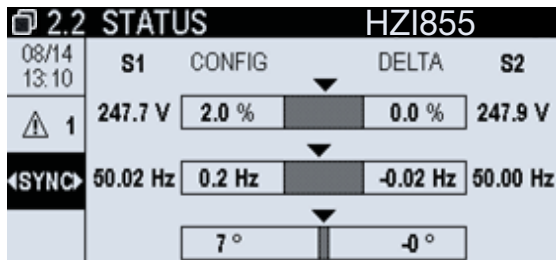
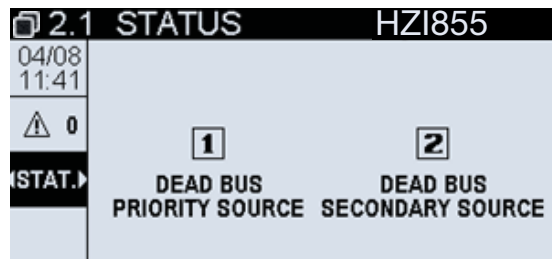
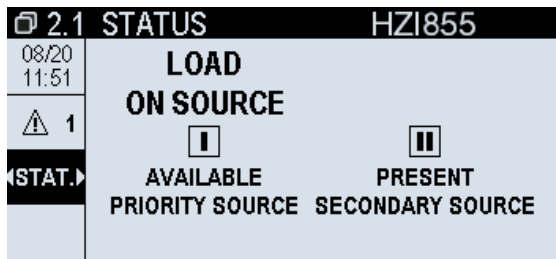
STAT.: gives the user information on the sources and loads.

INFO.: gives information on the time running of each source.

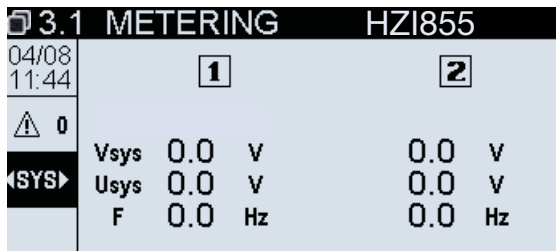


On the Summary display a mimic shows the status of the switch and the supply to the load. The sources will appear crossed if they are not available and not crossed if they are on. This information is also detailed in the status screen 2.1.

STATUS: Give more detailed information on the sources
 STAT.: Informs the user on the availability of each source.
 SYNC: Information on the voltage, frequency and phase angle of both sources.



METERING: Allows the user to visualize detailed metering information on the load side.
 U: Phase - Phase voltage.
 V: Phase - Neutral voltage.
 F: Frequency.
 SYS: Voltage, frequency and current of the system.




TIMERS: Allows the user to visualize the status of the timers.

RUN: Shows all the ongoing timers, and allows the user to bypass the timers

S1: Shows all timers linked to source 1

S2: Shows all timers linked to source 2

OPT: Shows all optional timers


4.1 TIMERS		HZI855	
08/19 16:30	Source 2 Start Timeout	00:00:19	
 1			
◀RUN▶			
Bypass Timer			

ALARMS: Allows the user to visualize active and finalized alarms. It also has a shortcut by pressing OK to go to the Alarms menu and clear alarms (password protected: operator).

ACT: Shows all active alarms, and allows the user to direct access to the alarm menu.

FIN: Shows all finalized alarms that are not acknowledged by the user.


In this screen, a direct access to the alarm log is available by pressing “down arrow” + “ok”, which will select the GO TO ALARM access in the left bottom of the screen. See more information about the alarm LOG in chapter 10.7.

5.1 ALARMS		HZI855	
09/12 11:57	TYPE	ALARM NAME	DATE/TIME
	Warn	PHASE ROT	09/12/19 11:57:06
 1			
◀ACT▶			
GO TO ALARM			

I/O: Allows the user to visualize the configuration of the I/O. The settings for the inputs and outputs on the controller will be shown.

IN: Controller inputs.

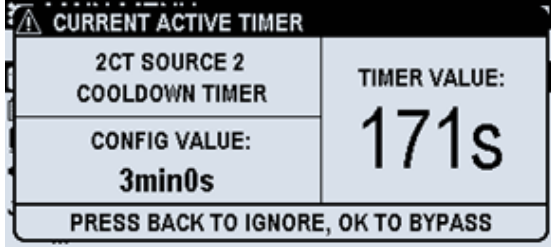
OUT: Controller outputs.

6.1 I/O		HZI855	
09/12 12:00	1	SWITCH IN POS. 1	ACTIVE
	2	SWITCH IN POS. 2	OFF
 1	3	NONE	OFF
	4	NONE	ACTIVE
◀IN▶	5	RST FAULT STATE	OFF
	6	TOTAL INHIBITION	OFF

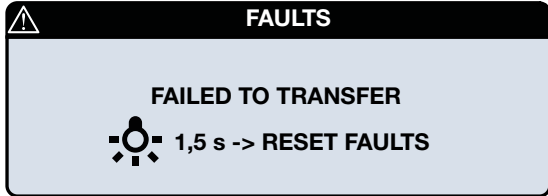
The visualisation pop-up:

The controller will inform the customer about the main real-time events through a pop-up. This pop-up can have 2 types of purpose:

- **CURRENT ACTIVE TIMER:** timer pop-ups show the name of the timer active, the configured value and the countdown value with double font. This is a dynamic pop-up that gives 2 options to the user: **BACK** to ignore (hide the pop-up but the timer will keep running and can be seen in the TIMERS dashboard) or **OK** to bypass (skip the timer and go directly to next action; this can also be done through the input **BYPASS TIMER**)- Bypassing the timer will request a validation and an operator password.



- Validation / Action requested: different events can use this type of pop-up, such as fault clearing, confirmation to run a test, confirmation to change parameters, validation to bypass a timer,... Usually these type of pop-ups can be ignored by pressing the **BACK** button and some of them offer different options to the user.

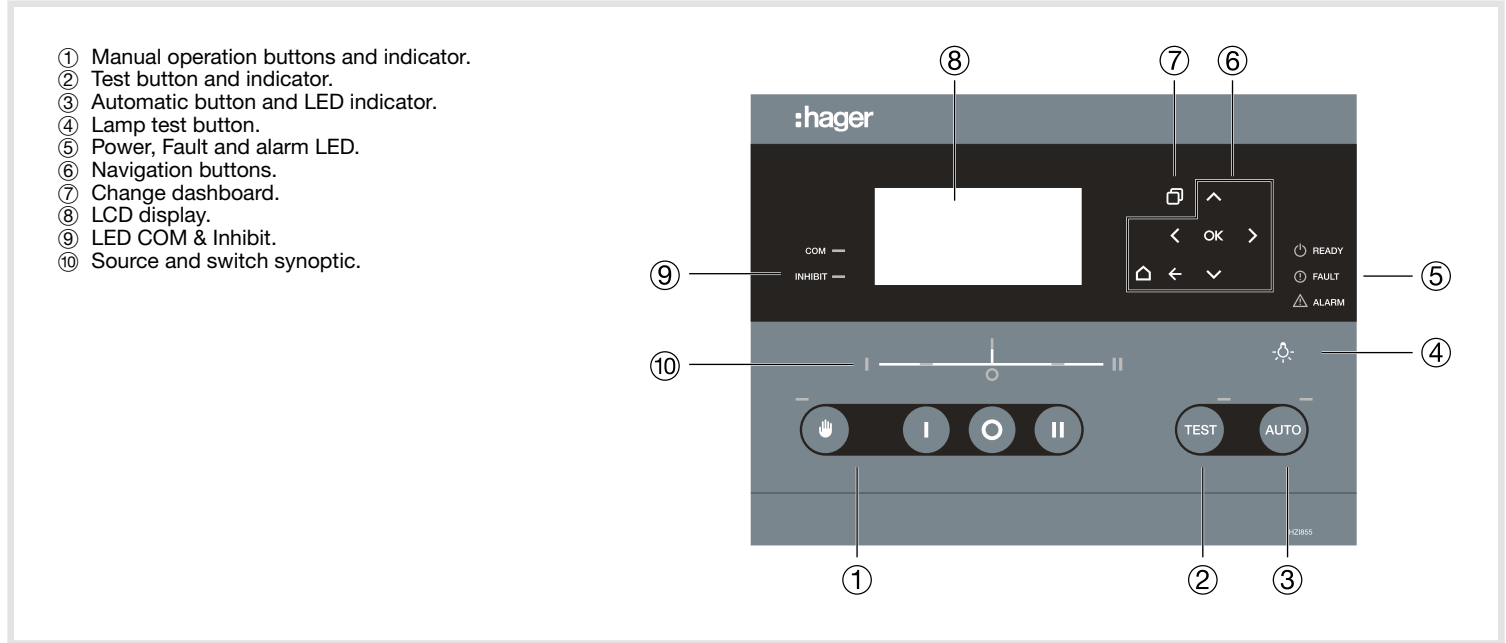


10. Operation and control

10.1. HMI use






On the front face of the controller there are 14 keys/buttons that are used to configure, operate and visualize the ATS values anytime.

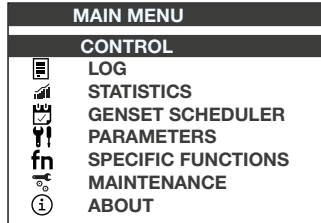
Summary of the HMI buttons:



Button	Operation
Manual	Turns on CTRL mode. Allows the use of the I, 0, II buttons that will send position orders to the switch.
Automatic	Turns on AUTO mode. Controller will automatically perform transfers in case of priority source unavailability and priority source comeback.
I	Position I (source 1) manual order. Only in CTRL mode.
0	Position 0 (center-off) manual order. Only in CTRL mode.
II	Position II (source 2) manual order. Only in CTRL mode.
TEST	Performs a TEST (as defined inside Parameters/Display/Options menu)
Arrows	Navigation through different screens, menus, options and values.
Lamp Test/Fault clear	Press: lamp test and information about LED on screen Long press: Clear faults pop-up (only if faults active)
Back/Menu	Press: back/return to previous screen or clear pop-up Long press: Back to Main Menu page
Dashboard	Change between dashboard type (1 to 7, in a loop)
OK/Save & Quit	Press: Enter / OK / set a value / accept / confirm Long press: (only when configuring) Save and Quit (back to previous configuration screen)

10.2. Navigation Menu

The Menu on the display can be access with the Return/Menu button on the front face of the controller. It is structured in different chapters and is easy to navigate through it with the navigation pad. To select a screen use the navigation arrows     , then press the ok key  to validate the selected screen.



CONTROL - This menu allows to change the operation mode as well as to test position orders and engine start signals. (See chapter 10.6)

LOG - In this menu, the operator can see the list of past events, search an event by date, see the statistics of the ATSE and manage faults and alarms. (See chapter 10.7)

STATISTICS - In this menu, the operator can see number of cycles and several operating hours.

GENSET SCHEDULER - The operator can set 4 different customized engine start programs and schedule them in a cyclic or non-cyclic mode. (See chapter 10.8)

PARAMETERS - In this menu all the configuration parameters of the ATSE can be set, as well as timers, communication, alarms, I/O and display parameters. Passwords and specific functions can also be set in this menu. (See chapter 11.1)

SPECIFIC FUNCTIONS - All functions that are specific for the controller are inside this menu. See all the options in chapter 11.1.8.

MAINTENANCE - This menu is reserved for maintenance purposes (service team). (See service chapter 12)


ABOUT - The main information of the controller is showed on this menu: product serial number, firmware, communication address and the maintenance telephone to call for the service.



The Home screen (Main Menu) can always be accessed by long-pressing the  button from any other screen.

10.3. Operating modes

The controller has 4 types of operation modes:

MANUAL (CTRL mode): it allows the user to take the control of the commands sent by the controller and the automatic procedure is totally disabled.


To enter manual mode, click the Manual operation button: 

The LCD will prompt the user to enter the operator password. The Manual mode LED will light up and the manual operation buttons will be enabled. Select  to switch to source 1,  to go to source 2 and  to go to center off position (if existing).



NOTE: In manual mode, if a source is lost, the genset (if any) will start but the controller will not force a transfer. The purpose is to keep the supply of the control and the communications.

AUTOMATIC: in automatic mode the controller will take the control over the switching device according to the settings (operating range, timers, etc).

To switch from manual mode to Automatic mode, make sure there are no external inhibitions to automatic mode (inputs, cover open, etc..) and click the automatic operation button: 

The LCD will prompt the user to enter the operator password. The automatic mode LED will light up.



The switch may transfer as soon as automatic mode has been enabled.

TEST: it allows the maintenance person to perform a transfer to **Source 2** and to decide when to go back to the **Source 1**. The testing of the ENGINE START can be performed using a TEST OFF LOAD test in the menu or assigning the TEST button to this function. The TEST mode can be launched from both MANUAL or AUTOMATIC modes.

To switch to TEST mode, make sure there are no external inhibitions and click the automatic operation button: **TEST**

The LCD will prompt the user to enter the operator password. The TEST mode LED will light up.



The switch may transfer as soon as TEST mode has been enabled, respecting the elevator timers, inphase timers (for open transition switches with positions I-II) and center-off position timer (if the switch has a 0 position).

The switch may transfer as soon as TEST mode has been enabled, respecting the elevator timers, in-phase timers (for open transition switches with positions I-II) and center-off position timer (if the switch has a 0 position).

INHIBIT MODE: This mode is activated in case of major faults, switch cover open. In inhibited mode the switch will not be operable using the controller.

These modes can also be selectable through the display, through inputs or through communications; LED will indicate the state of the switch.



To change the operation mode, a password might be required.

10.4. Availability conditions

There are 3 different status for the sources:

- Busbar dead
 - No voltage present on the source (all voltages below 50V).
- Source present
 - Voltage present (at least 1 phase above or equal to 50V) but availability conditions are not reached (see “Source available” below)
- Source available
 - To consider the source available:
 - the voltage and frequency should be inside the limits set in the operating range
 - all phases should be present (according to the network configuration selected)
 - sources should not be set by an input as unavailable / inhibited
 - phase rotation should be ok (if check rotation is selected in the menu).

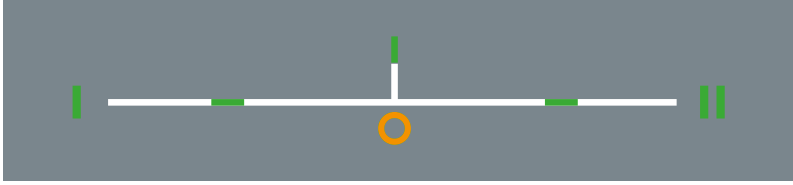
For source availability the controller is checking as well the loss of the connectors upstream the sensing connection to the phases and the neutral:

- Loss of Neutral: will be detected in all cases except for balanced networks with balanced loads, where is not possible to detect the loss unless the load has a minimum value of unbalance.
- Loss of Phase: will be detected in all cases.



It is not possible to detect a loss of phase or neutral downstream of the controller's connection to the supply to the switching device.

The synoptic on the HZI855 controller informs the user on the status of the sources:



The round green LED next to S1 or S2 indicates if the source is available or not:

- If the LED is on but not blinking then the source is considered as available.
- If the LED is blinking, the voltage is present but the source is not considered available.
- If the LED is off, then the busbar is dead.

The 2 rectangle green LED and the center orange LED indicates the position of the switch:

- If the LED is on, the switch is closed on that position (I or II).
- If the LED is blinking, the controller considers the switch is in that position, but there is no return from the switch (the input has to be configured as a position).
- If the LED is off, the switch is not in that position.

The green LED in the center-up of the diagram indicates if the load is powered:

- If the LED is on, the load is supplied by either source 1 or source 2, which means that the source is available and the switch is in one of these positions.
- If the LED is blinking, the load is supplied but a load shedding is taking place.
- If the LED is off, the load is not supplied (switch not closed on an available source).

The "0" amber LED under the load LED indicates the center-off position:

- If the LED is on, the switch is in center-off position (only if there is a 0 position)
- If the LED is off, the switch position is either on S1, S2 or unknown (should always be off for technologies without 0 position)
- If the LED is blinking, the controller considers the switch is in that position, but there is no return from the switch (the input has to be configured as 0 position)

10.5. Test operating mode

TEST button on the HMI can be used (by default) to perform a TEST ON LOAD (as standard) or TEST OFF LOAD and can be configured inside the PARAMETERS/DISPLAY/OPTIONS menu (TEST BUTTON USE).

TEST ON LOAD Main-Gen: a test on load sequence will start by sending a start-gen signal to the secondary source (if in MAIN - GEN) , and will initiate a transfer to the secondary source, once the test has ended the switch will transfer back to the priority source.

TEST OFF LOAD will initiate starting of the genset but will not give the order to transfer to the secondary source when it becomes available.

The duration of the tests can be limited (in the configuration) or can be set to Unlimited, when set to unlimited the user will have to press the test button again to stop the tests.

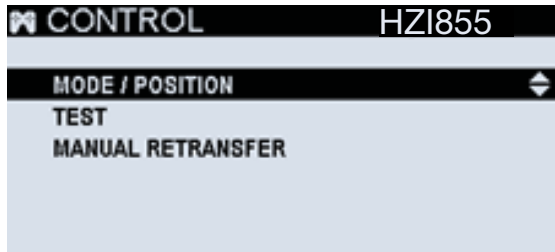
This operation can also be performed with an input, using the EXT TEST ON LOAD function.



NOTE: TEST ON LOAD will cause a load supply interruption when testing the transfer function as the load will change from one source to another in open transition.

10.6. Control Menu

There are 3 type of commands available in the control menu and all of them require the operator profile password. Those commands are:

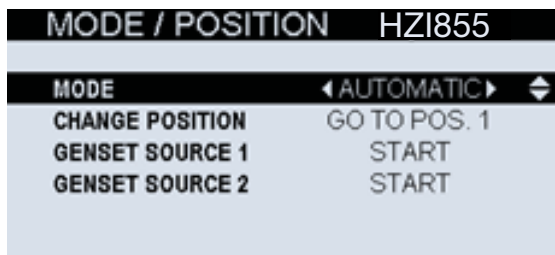


MODE / POSITION: permits changing the operating mode, change position in CTRL mode and start/stop the gensets remotely (also in CTRL mode)

MODES:

- AUTOMATIC: Standard automatic functioning of the controller
- MANUAL / CTRL: Control of the switch manually using the controller to give orders to the switch. Buttons I-0-II are unblocked on the front face.
- INHIBIT: Both CTRL and AUTO functions are inhibited until the mode changes. Message on the main dashboards (1.1 and 2.1) and buttons I-0-II, AUTO and CTRL will disable this mode but no remote orders will be taken into account.

NOTE: For a total inhibition, the inhibition inputs have to be used.



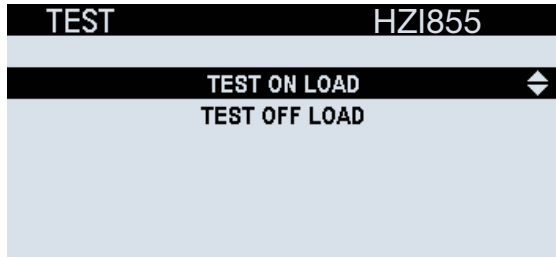
CHANGE POSITION: (only in CTRL mode) permits sending orders to go to position 1, 0 (center-off) or 2 to the switch device.

GENSET SOURCE 1/2: permits START or STOP the gensets installed as source 1 or 2.

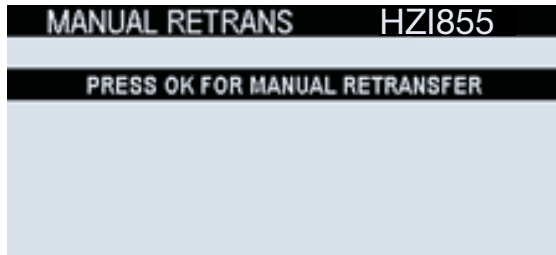


NOTE: The CONTROL/MODE menu is an "order" menu, to activate commands, but it doesn't show the current mode or position (to visualize that the user needs to go to the dashboard screens).
Example: mode can be inhibited, but when entering the menu the mode will say "automatic" (which is not the current mode, it's just a list of possible orders to be used).

TEST: permits launching a TEST ON LOAD or a TEST OFF LOAD. See previous chapter for further explanation.



MANUAL RETRANSFER: when “manual retransfer” option is selected in SPECIFIC FUNCTIONS / MANUAL RETRANSFER, the operator will need to validate the retransfer (directly on the HMI as shown below or using external inputs) the retransfer from alternate/secondary to priority/preferred/primary source by pressing OK and confirming in this screen.



10.7. Log Menu

The LOG menu contains all the HISTORY / EVENTS LOG (operations, timers, mode changes, configuration changes, product status, source availability), ALARMS (user-selectable alerts) and FAULT (major alerts, not selectable by user, set by default). All the LOG menu elements are protected by the “operator” password (see chapter 11.1.7).

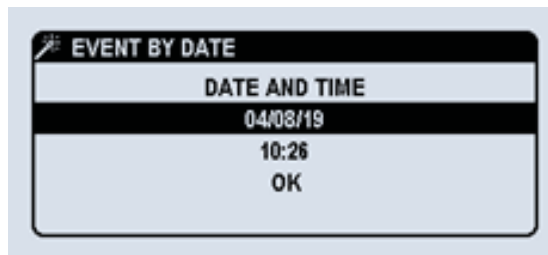


EVENTS LOG: HZI855 can store up to 300 events using FIFO to replace older events when the memory is full.

The event log will show the information of virtually everything happening on the controller/ATS with timestamp and description. To navigate through the event log, the UP and DOWN arrows can be used to advance on the event list one by one and the LEFT and RIGHT arrows to advance 6 events every time.

As the controller can host a large number of registers in the log, the EVENT BY DATE functions is a search engine that permits to go directly to a selectable date and time and see the events that took place at that moment.

EVENTS LOG		HZI855
Phone number changed	04/08/19 08:14:42	
S2 Not Started	04/08/19 08:14:31	
S2 Wait for Start Timer Stop	04/08/19 08:14:31	
S2 Lost	04/08/19 08:14:00	
S1 Lost	04/08/19 08:14:00	
S2 Underfrequency	04/08/19 08:14:00	

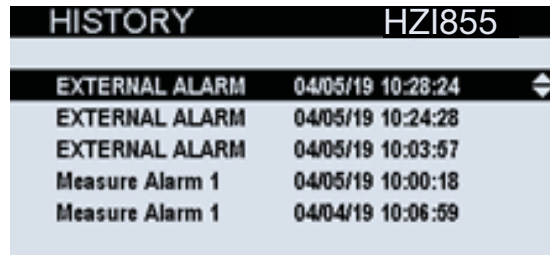
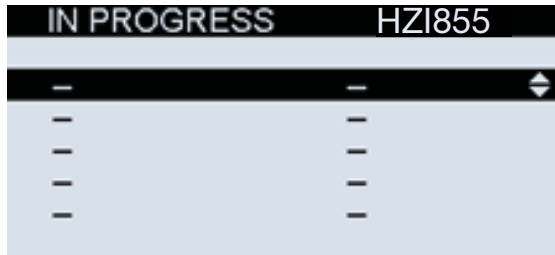


ALARM LOG: the log can store up to 100 alarms or faults, even if they are in 2 different menus to make it simpler to the user. Inside alarm log screen, there are 2 options: in progress and history. "In progress" shows all active alarms and the history shows all the last finalized alarms.

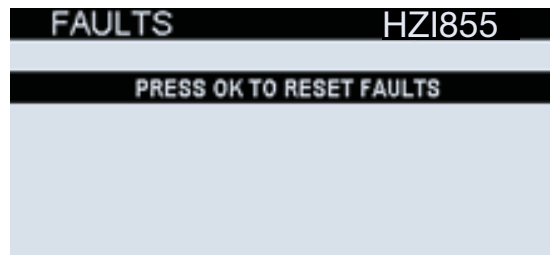
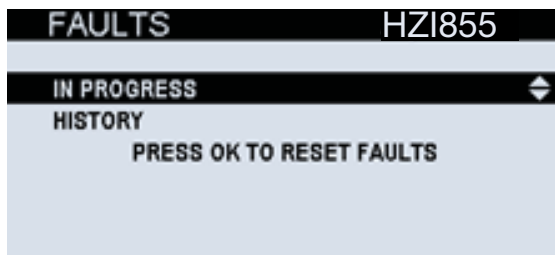


For each alarm, unlike with the events, the details are available, permitting the user to see:

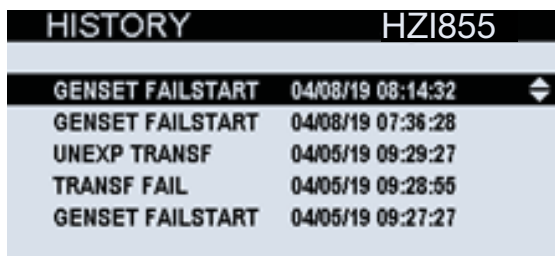
- Type of alarm
- Status
- Starting time and date
- Duration of the alarm active (counter running for active alarms)
- Criticality of the alarm
- To learn about alarm configuration and options (see chapter 11.1.6).



FAULTS: 100 registers of faults and alarms can be stored inside the internal memory and they are divided into "in progress" and "history". Faults, however, permit also resetting faults using the option "PRESS OK TO RESET FAULTS" and confirming on the pop-up that appears on screen.



Faults, to the contrary of alarms, have no detail of each register. On the history log, the information is the fault description and the time & date when it occurred.



STATISTICS: On this screen, user can see all the counters for:

- Cycles (operating hours, number of cycles, cycles in manu, cycles in auto)
- Operations (total and for each position)
- Running hours (total and partial) (partial can be reseted by user)
- Source 1 / Source 2 data (total time in source, partial time, last switch, total time on load)
- Genset 1 / Genset 2 data (total active time, total active time on load, genset start counter)

STATISTICS		HZI855
OPERATING HOURS		6 d 46 min39s
CYCLE CNT		27
TOT CYCLES IN AUTO CNT		5
TOT CYCLES IN MANU CNT		22
-		
GENSET 2 <- CYCLES -> OPERATIONS		

10.8. Genset scheduler / Engine Exerciser Menu

There are 4 selectable engine exerciser programs that are set in order of priority on the display. That means that the program “CUSTOM 1” is priority over the “CUSTOM 2” if both happen to occur at the same time. This is to avoid exercising a genset that it’s being already exercised. Inside the GENERAL PARAMETERS menu in the same screen, it can also be set a “GENSET IDLE TIMEOUT” time in minutes to avoid exercising a genset that has just been active just a few minutes/hours before. By default this value is set to 168minutes but if is not desired, it can be configured to 0 to follow strictly the exerciser programs.

SCHEDULER		HZI855
GENERAL PARAMETERS		
CUSTOM 1		
CUSTOM 2		
CUSTOM 3		
CUSTOM 4		

For each program (CUSTOM 1-4), the following settings can be defined individually:

Type of test: type of test that will be performed on this program

- TEST ON LOAD / LOAD TEST: will perform a full test including all the timers and operating the switch (full cycle).



NOTE: on all switches, a TEST ON LOAD will cause a load supply blackout when testing the transfer function.

- TEST OFF LOAD / NO LOAD TEST: will perform a genset start for the defined time, and a genset stop after the time elapses.
- Nothing / NOT USED

Periodicity: every how often will the program take place. It can be set yearly, semi-yearly (every 6 months), bimonthly (every 2 months), monthly, 28 days, biweekly (every 2 weeks), weekly, every 2 days, daily or NON CYCLIC (no repetition, single use).

TEST DURATION: that’s the time the generator will run with the load before transferring back to priority source (for example, 15minutes).



If using “MANUAL RETRANSFER” specific function, the transfer to the main source will not take place after this time, but it will wait user validation to retransfer.

Starting time&date: that's the date&hour where this periodic program will start (for example, starting on January 5th at 1pm). (date and hour when first TEST will take place)

Ending time&date: that's the date&hour where the program will stop (for example, May 12th at 4pm) (after this date, this program will not execute a TEST).

CUSTOM 1		HZI855
TYPE SET	◀NOT USED▶	
PERIODIC SCHEDULE	YEARLY	
TEST DURATION (s)	00000	
START DATE	01/01/00	
START TIME	00.00	
...		

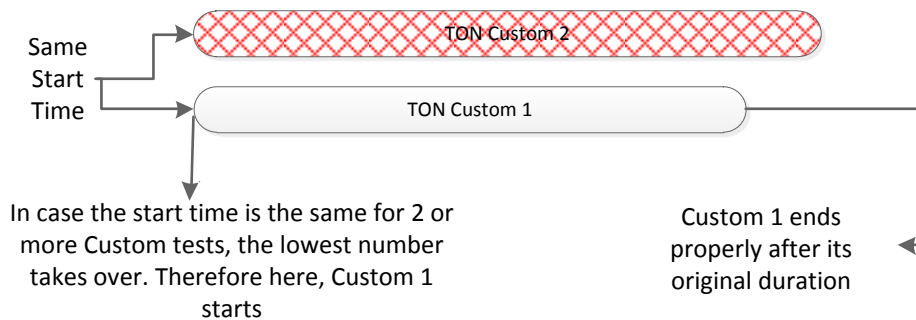
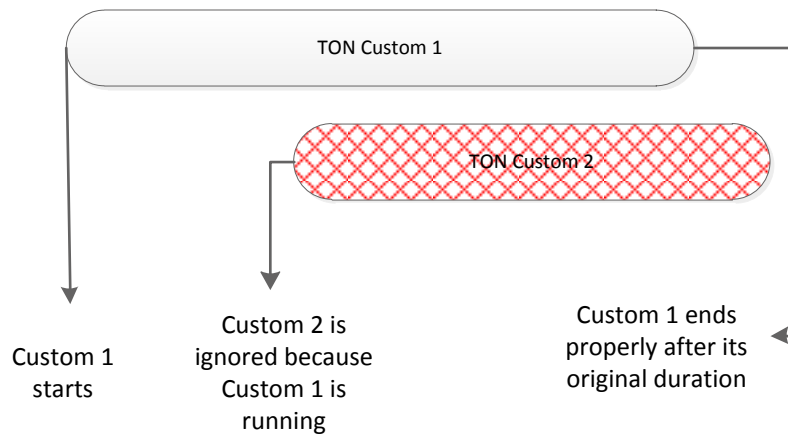
*Example:

- Type: ON LOAD
- Periodicity: Monthly
- Test duration: 15min
- Starting time & date: January 5th at 1pm
- Ending time & date: May 12th at 4pm

The exerciser program will do the following:

Exerciser will carry on a full test on load (starting genset if any, counting timers and operating the switch and transferring loads from priority source to alternate source) on Jan 5th at 1pm for 15 minutes. This will be repeated every month at the same time (1pm) for the following months until May, when the last exerciser will take place on May 12th at 1pm). After May12th 4pm, the exerciser is over (ending date & time).

In the case of overlapping several exerciser/scheduler programs, the priority one (lower custom number) will take place and not the others. Examples:



11. Configuration

The configuration on the HZI855 can be done directly on the HMI.

NOTE: The configuration can be done even without cabling the AC or DC supply to the controller, only connecting it to a computer with an USB cable. The controller will use the USB to power up the screen, buttons and main functions, permitting the configuration through any of these methods.

11.1. Configuration through the display

How to configure the main parameters manually using the display:



PARAMETERS MENU

Inside the PARAMETERS menu of the Main Menu (accessible by entering the Configurator password, by default 1000) all the main parameters of the controller can be set:

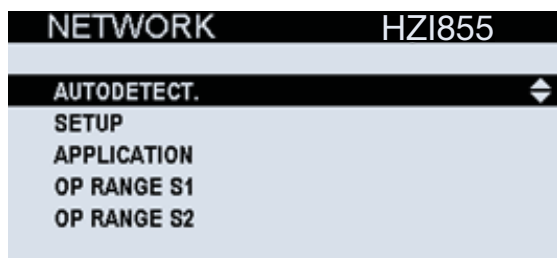
- NETWORK:** Permits the configuration of the nominal voltage and frequency, the phase rotation, the type of switch and the sources priorities, as well as the operating range where the controller will consider a source as available. See chapter 11.1.1.
- DISPLAY:** Permits selecting the language, setting the date&time and choosing the preferences for the screen and the test button use (“load test” or “no load test”). See chapter 11.1.2.
- TIMERS:** Permits setting all the different operation timers (automatic mode). See chapter 11.1.3.
- I/O:** Permits the configuration of the Inputs and Outputs of the controller. See chapter 11.1.4.
- COMMUNICATION:** Permits the configuration of the communication parameters such as the Modbus address or the baudrate. See chapter 11.1.5.
- ALARMS:** Permits programming different alarm types that can be linked to outputs and will show the information on the screen. See chapter 11.1.6.
- PASSWORDS:** Permits changing the passwords for the different users. See chapter 11.1.7.
- WIZARD:** Permits launch a wizard configuration. See chapter 8.



IMPORTANT NOTE: When doing the configuration through the display, don't forget to put the controller in AUTO mode after the configuration is over to start the AUTOMATIC mode.

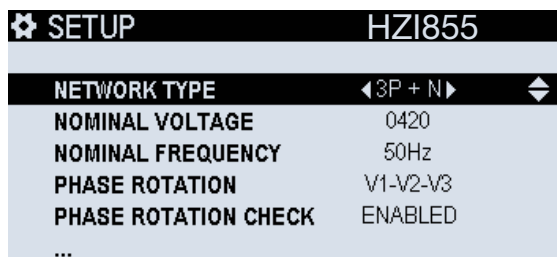
11.1.1. NETWORK parameters menu

The NETWORK menu allows the user with the Configurator profile to configure the installation parameters. Inside NETWORK, there are 5 different submenus:



AUTODETECT.: When selected the function, a pop-up will show asking for a validation from the user to start autodetecting the network type, the nominal voltage and frequency and the phase rotation. After the autodetection the result can be consulted and modified in the SETUP menu. Information can be consulted on the SETUP menu.

SETUP: Settings concerning the installation can be configured here:

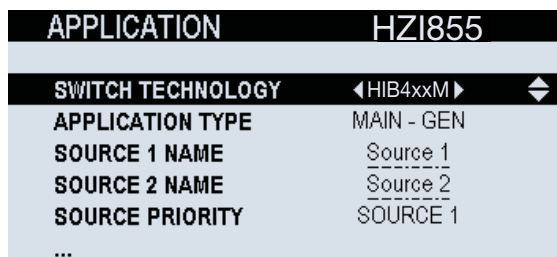


- Network type: number of poles and wires. See detail on page "NETWORK TYPE" inside this chapter.
- Nominal voltage
- Nominal frequency
- Phase rotation (ABC or ACB // V1 V2 V3 or V1 V3 V2)
- Phase rotation check: it can be enabled or disabled. By default is enabled but it can be disabled for applications where the portable genset can be replaced frequently by others using different rotation.
- VT used: (used or not used) Voltage Transformers can be used for all applications with V levels above 576V, that it's the maximum that the controller can measure directly (ph-ph). Example: 600/480V transformers for 600V applications. Ratio has to be added right after where it says "VT primary" and "VT secondary".



In order to save the settings it's mandatory to select SAVE CONFIG on the bottom of the screen or press OK button for 1,5 s and a pop-up will appear asking for confirmation before "SAVE AND QUIT?".

APPLICATION TYPE: Settings concerning the usage of the controller (which type of switch, type of sources, priorities...)



SWITCH TECHNOLOGY: Type of switching device / RTSE. Options by default are:

- **CIRCUIT BREAKER** - (MCCB or ACB) makes reference to standard IEC 60947-2 circuit breakers with 2 positions per device (ON and OFF), offering the option to have 3 positions when used as a transfer switch (I-0-II).
- **HIB4xxM** (remote / double supply) makes reference to HIB4xxM Hager switches.
- **CONTACTOR** - (circuit contactor) makes reference to standard IEC 60947-4-1 contactors with 2 positions per device (ON and OFF), offering 3 positions (I-0-II). This technology forces the maintained logic for the position order outputs on the controller.

NOTE: To make configuration easier, the controller automatically changes the I/O configuration for position orders and position return feedback from the switch (using preset values) according to the technology that will be set in the controller.



For safety reasons the change of technology has to be done on Manual mode and requires the configurator profile password.

APPLICATION TYPE:

- **MAIN** - MAIN or **UTILITY** - UTILITY when using 2 transformers as source 1 and 2.
- **MAIN** - GEN or **UTILITY** - GEN when using a transformer and a genset as sources.

SOURCES NAME: user can enter a name for each source. By default “Source 1” and “Source 2”

SOURCE PRIORITY: priority/preferred source can be set for source 1, source 2 or “no priority”. In the “no priority” case, the switch will be closed on either one source or the other as long as they are available.

LOGIC: according to the inputs of the switch to receive position orders, there are 2 types of logic:

- **IMPULSE / PULSE:** the output from the controller will send a pulsed signal with a defined duration to the switch to change position.
- **CONTACT / MAINTAINED:** the output from the controller will close and stay closed indefinitely as long as the switch is requested to stay in a position. This logic is used mainly with contactors but also with breakers and class PC switches that accept it. In that case, for example, if position 2 order is activated it will close the output until the transfer, when the output will be off to switch to center-off / position 0 and after go to position 1.

TEST / EXT TEST ON LOAD PRIO (yes/no): with this option, when a TEST is taking place, it will stay in test position until it finishes (timers are elapsed) even if the source is lost.



If the test is set as Unlimited, the switch will stay in test position until the user finishes the test.

RETRY NUMBER (0-10): If the position is not reached after a position order, the controller can perform several retries.

RETRY DELAY (0-10000ms): delay between retries.

PULSE LENGTH (ms): length of the pulse (only for PULSE mode).



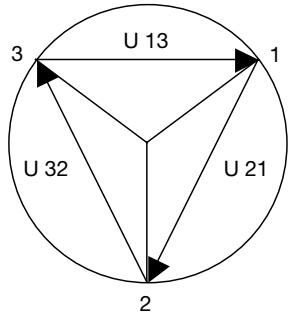
In order to save the settings it's mandatory to select **SAVE CONFIG** on the bottom of the screen or press **OK** button for 1.5 s and a pop-up will appear asking for confirmation before “**SAVE AND QUIT ?**”.

OP RANGE S1 and S2: Permits setting the limits of acceptability for the sources 1 and 2 respectively.

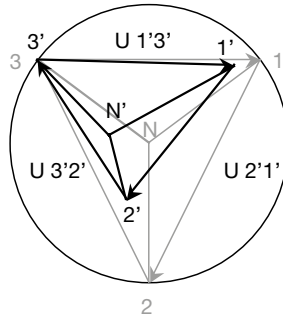
OP RANGE S1	HZI855
S1 OV FAIL (%)	115
S1 OV RESTORE (%)	110
S1 UV FAIL (%)	85
S1 UV RESTORE (%)	95
S1 UB FAIL (%)	00
...	

OP RANGE S2	HZI855
S2 OV FAIL (%)	115
S2 OV RESTORE (%)	110
S2 UV FAIL (%)	85
S2 UV RESTORE (%)	95
S2 UB FAIL (%)	00
...	

- OV = overvoltage
- UV = undervoltage
- OF = overfrequency
- UF = underfrequency
- UB = unbalance



Balanced network

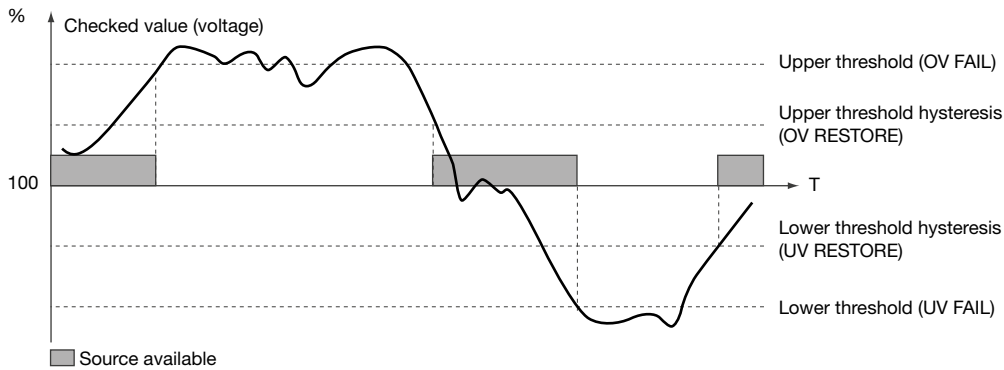


Unbalanced network

For each parameter, the limits can be set in % vs the nominal value and there are two parameters to set: the tripping value that will make the source be considered unavailable (FAIL) and the value that will make the source be considered available again (RESTORE).

The thresholds and hystereses are defined as percentages of nominal voltage.

The hystereses define return to normal levels following an under-voltage or over-voltage.



In order to save the settings it's mandatory to select **SAVE CONFIG** on the bottom of the screen or press **OK** button for 1.5 s and a pop-up will appear asking for confirmation before "SAVE AND QUIT?".

		Definition	** Adjustment Range
OV FAIL	115%	Overvoltage threshold: Source 1	102 ... 130%
OV RESTORE	110%	Over-voltage hysteresis: Source 1	101 ... 129%
UV FAIL	085%	Undervoltage threshold: Source 1	60 ... 98%
UV RESTORE	095%	Undervoltage hysteresis: Source 1	61 ... 99%
UB FAIL	000%	Phase unbalance threshold: Source 1 Refer to next paragraph for further details	0 ... 30%
UB RESTORE	000%	Hysteresis unbalance threshold: Source 1 Refer to next paragraph for further details	0 ... 29%
OF FAIL	105%	Over Frequency Threshold: Source 1	102 ... 130%
OF RESTORE	103%	Over Frequency Hysteresis: Source 1	101 ... 129%
UF FAIL	095%	Under Frequency Threshold: Source 1	60 ... 98%
UF RESTORE	097%	Under Frequency Hysteresis: Source 1	61 ... 99%

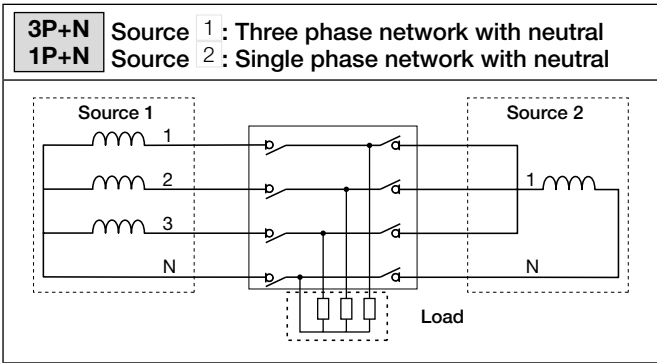
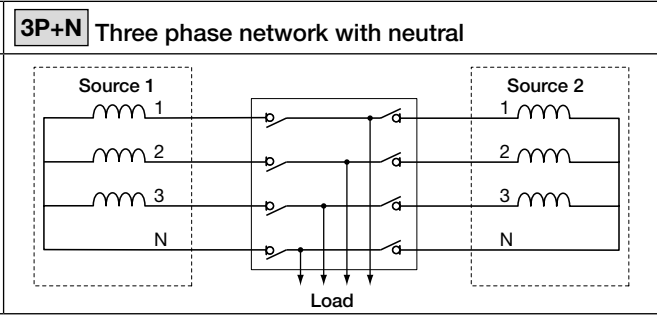
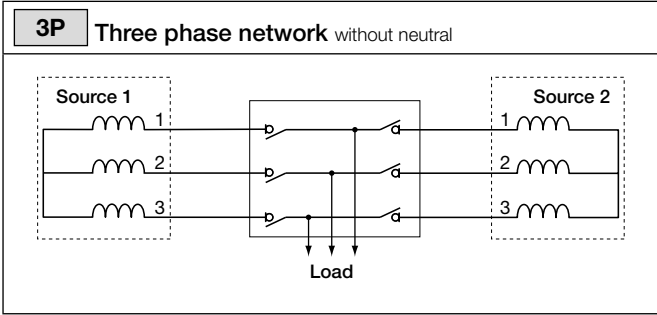
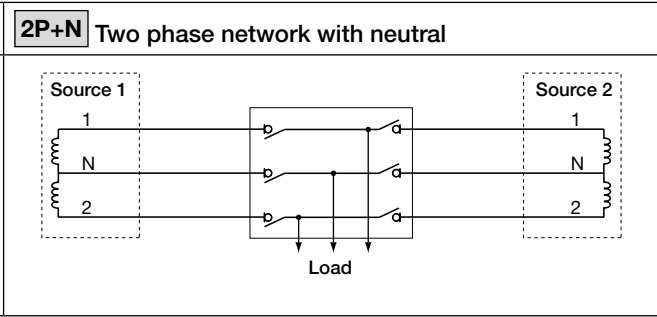
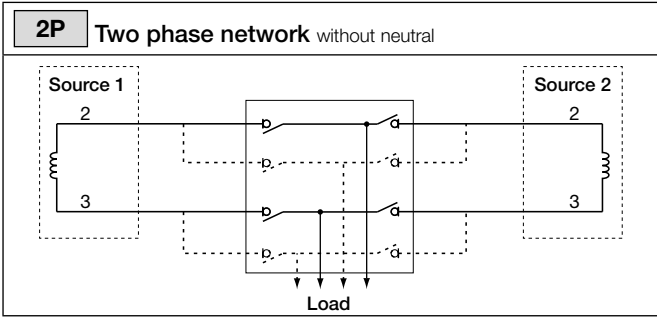
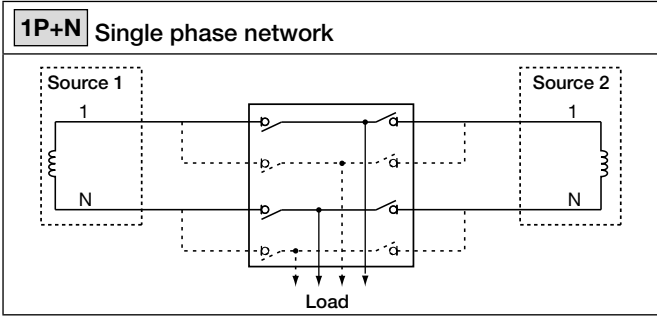
** Adjustment range given:

As a % of U nominal for Over and Undervoltage



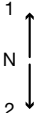
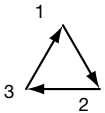
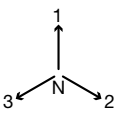
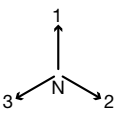

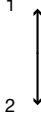
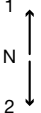
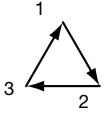
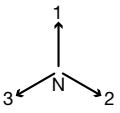

As a % of U avg in case of unbalances.

As a % of nominal frequency

Types of Network



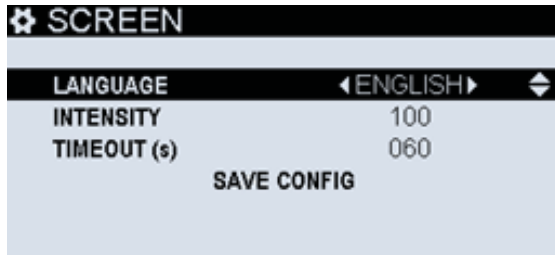
Metering and sensing details

Network type						
	1P	2P	2P+N	3P+N	3P+N	3P+N / 1P+N
Source 1	1 phase 2 wire	2 phase 2 wire	2 phase 3 wire	3 phase 3 wire	3 phase 4 wire	3 phase 4 wire
Source 2						1 phase 2 wire
Source 1						
Source 2						
Voltage sensing						
Source 1	- V1	12	U12 V1, V2	U12, U23, U31	U12, U23, U31 V1, V2, V3	U12, U23, U31 V1, V2, V3
Source 2	- V1	12 -	U12 V1, V2	U12, U23, U31 -	U12, U23, U31 V1, V2, V3	- V1
Source presence (source available)	✓	✓	✓	✓	✓	✓
Source in ranges (U, V, F)	✓	✓	✓	✓	✓	✓
Rotation phase order	-	-	-	✓	✓	S1 only
Neutral position	-	-	✓	-	✓	S1 only
Voltage unbalanced is lower than threshold	-	-	-	✓	✓	S1 only
Applicable metering						
Source 1	- V1 f1	U23 - f1	U12 V1, V2 f1	U12, U23, U31 - f1	U12, U23, U31 V1, V2, V3 f1	U12, U23, U31 V1, V2, V3 f1
Source 2	- V1 f2	U23 - f2	U12 V1, V2 f2	U12, U23, U31 - f2	U12, U23, U31 V1, V2, V3 f2	- V1 f2

11.1.2. DISPLAY parameters menu

The PARAMETERS / DISPLAY menu allows to set the main parameters for the HMI.

SCREEN PARAMETERS:

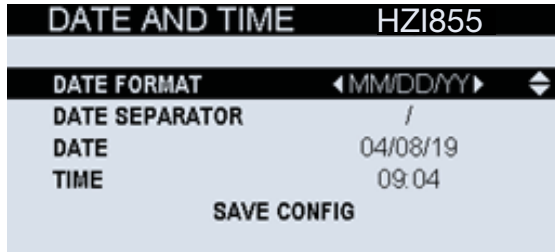


Languages available:

- English
- French
- Spanish
- Italian
- Chinese
- Turkish
- Portuguese
- German
- Polish

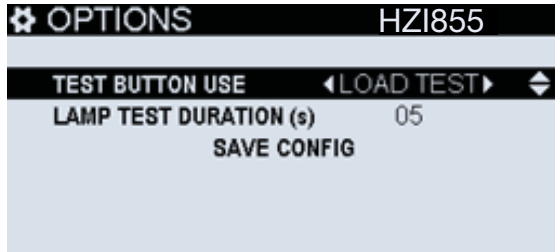
“Timeout” sets the time in seconds where the screen will remain on after touching a button.

DATE AND TIME PARAMETERS:



Date and time will remain running thanks to the RTC battery even if all sources are off.

OPTIONS for the HMI buttons:



- TEST button use (between ON LOAD or OFF LOAD test)
- LAMP TEST DURATION (s): This will allow the user to change the duration of the lamp test button "insert lamp test button" available on the HMI. The lamp test will start after the button is pressed and the user can end the lamp test at any time by pressing the button again before this time limit.

CHANGE PRODUCT NAME: allows changing the name of the ATS. This information will appear on all the dashboards and menus on the top-right of the screen.

11.1.3. TIMERS parameters menu

All the operational timers can be set on this menu. They are up to 26 general timers splitted into 4 groups:

NOTE: The specific functions with timers are not included in this chapter. Consult the Timers Annex II in chapter 13.2 to have the full list.

Operation timers (6 timers):

OPERATION	HZI855
S1 FAILURE (s)	03.0
S1 RETURN (s)	0003
S2 FAILURE (s)	03.0
S2 AVAILABLE (s)	0005
SAVE CONFIG	

- FAILURE TIMER (s): time after source is lost, to make sure it's really lost and start a transfer.
- RETURN TIMER (s): time after a transformer/main source that was off comes back, to make sure it really came back.
- AVAILABLE TIMER (s): time for a genset/diesel generator source to be on and inside the right defined values to be considered available and ready to accept a transfer.
- S1 DEAD BAND (s): time to wait without load supply (including source failure time and time in center-off / zero position) when transferring from S1 to S2.
- S2 DEAD BAND (s): time to wait without load supply (including source failure time and time in center-off / zero position) when transferring from S2 to S1.



By default, S1 and S2 DEAD BAND are the same and set to 3 s.

Tests on load (5 timers) and off load (4 timers):

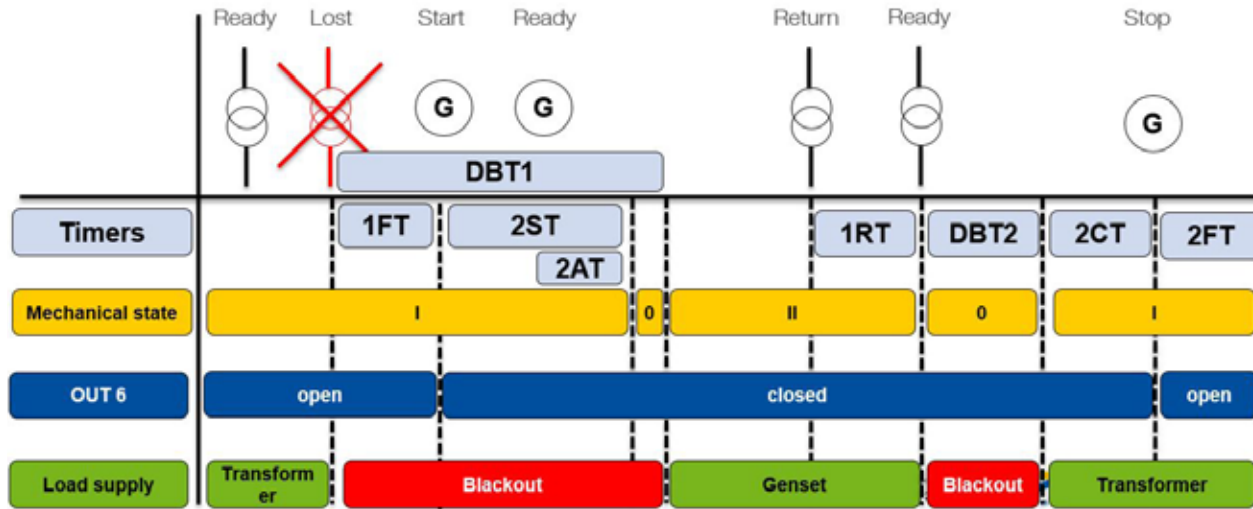
ON/OFF LOAD TEST (limited or unlimited) Limited means there is a defined test time and it will perform the changeover and the comeback to the priority source. Unlimited will require the acceptance from the user to comeback to priority source. Otherwise, it will stay in secondary source waiting confirmation unless the secondary source is lost and priority one is available, in that case it will transfer and end the test automatically (except if the option TEST PRIO has been selected on the NETWORK/APPLICATION menu).

LOAD TESTS	HZI855
LOAD TEST	◀UNLIMITED▶
LOAD TEST (s)	00010
LOAD TEST END (s)	0005
EXT LOAD TEST PRE (s)	0005
EXT LOAD TEST	UNLIMITED
...	

NO LOAD TESTS	HZI855
NO LOAD TEST	◀UNLIMITED▶
NO LOAD TEST (s)	00600
EXT NO LOAD TEST PRE (s)	0005
EXT NO LOAD TEST	LIMITED
EXT NO LOAD TEST (s)	00600
...	

- TEST (s): duration of the test
- TEST ON LOAD END (s): after a test on load (not external), time to wait in secondary source before going back to priority source.
- EXT TEST ON/OFF LOAD PRE (s): pre-timer before starting transfer to secondary source on an external test.
- EXT TEST ON/OFF LOAD POST (s): post-timer after finishing the test and going back to priority source on an external test.

- Example of a full sequence with all the main operation timers:
- Network Main-Genset, priority on Network (Transformer)
 - No manual retransfer. Elevator signal active (specific function)



LEGEND:

- 1FT = Failure timer S1
- 2ST= Genset start timeout timer
- 2AT= Availability timer S2
- DBT1= Dead band timer S1
- 1RT= Source 1 return timer
- ELD = Elevator delay & ELR = Elevator restore
- DBT2= Dead band timer S2
- 2CT= Cooldown timer genset S2
- 2FT= Source 2 failure/disconnection timer

To see the different timer configuration in detail, consult the TIMERS annex in this instruction manual.

11.1.4. I/O parameters menu

All the I/O can be set on this menu. By default, the controller has 6 inputs and 6 outputs on the controller (called internal Inputs / Outputs). The I/O menu has the following submenus:

INPUTS: permits configuring the 6 internal inputs

INPUTS		HZI855
INPUT1	◀	SWITCH IN POS. 1 ▶
INPUT2		SWITCH IN POS. 2
INPUT3		NONE
INPUT4		NONE
INPUT5		EXT. LOAD
...		

OUTPUTS: permits configuring the 6 internal outputs

OUTPUTS		HZI855
OUTPUT1	◀	POS 1 ORDER ▶
OUTPUT2		POS 2 ORDER
OUTPUT3		NONE
OUTPUT4		FORCED SHEDDING
OUTPUT5		ELEVATOR
...		

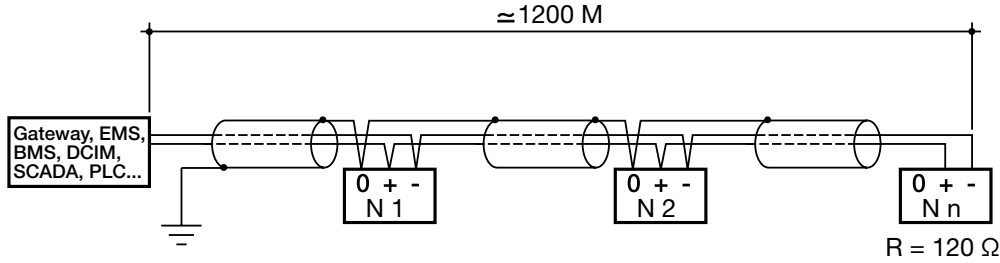
Consult the I/O Annexes in chapters 13.3 and 13.4 to have the full list of functions to be configured on the I/O.

11.1.5. COMMUNICATION parameters menu

RS485

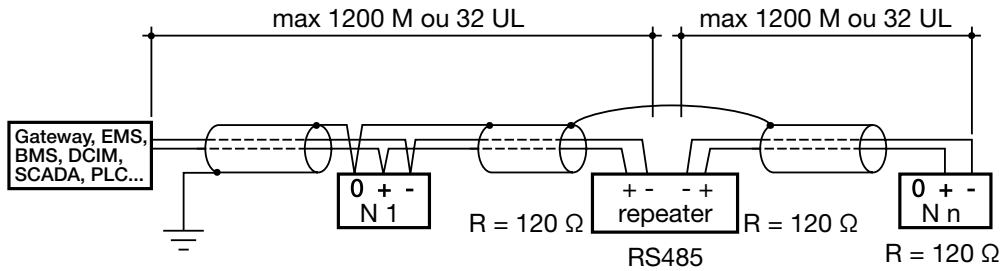
The MODBUS RTU protocol available on the HZI855 communicates via an RS485 series link (2 or 3 wires) which is used to operate, configure or read parameters from a PC or an API.

In a standard configuration, a RS485 connection is used to connect 32 products to a PC or a controller up to 1200metres (1300yds) far.

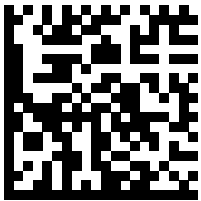


A LIYCY shielded twisted pair must be used. We recommend using HTG485H (25m Modbus cable), a shielded twisted pair with a general LIYCY-CY shielding in a environment where there is interference or in a very long network with a number of products.

If the distance of 1200 m is exceeded and/or the number of products is greater than 32, a repeater must be added to enable additional products to be connected. A 120 Ohm resistor must be fixed at both ends of the connection.



Communication tables: can be found on the website at the following address:

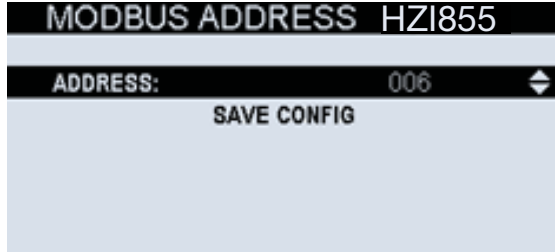


<http://hgr.io/r/hzi855>

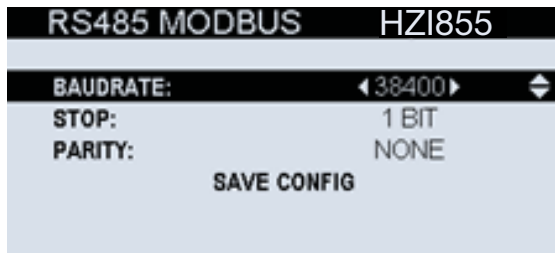
Communications Menu:

HZI855 have RS485 communication by default using MODBUS RTU protocol. Inside the communication menu the main parameters to make that communication effective can be set.

MODBUS ADDRESS: By default 6, any value between 1 and 247 can be used.



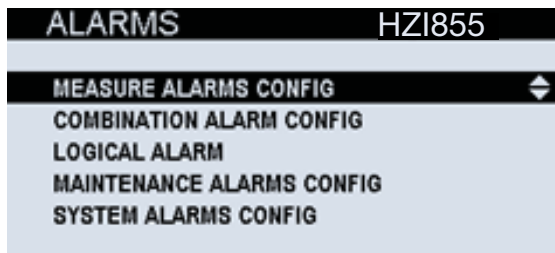
RS485 MODBUS: All Modbus parameters can be set here:



- BAUDRATE (1200-2400-4800-9600-19200-38400-57600-115200) By default 38400.
- STOP: (1BIT - 2BITS) By default 1 BIT
- PARITY: (ODD-EVEN-NONE) By default none

11.1.6. ALARMS parameters menu

The ALARMS are different from the FAULTS on the Controller. The Alarms are user configurable while the faults are internal to the product and can't be disabled. Everything that is critical for the application is set as Fault (chapter 12, maintenance, to know more about Faults).



All alarms are by default DISABLED and should be enabled if the user wants to use them. For each alarm, it can be set a threshold, an acknowledgement method, an output type, an output report and a criticality.

Thresholds: this is the value that will trigger the alarm. For the inspection time, for example, it will be the time since the last inspection (set on Inspection Mode) and for the other types it will be the number of operations/cycles or a time value in seconds.

Acknowledgment method: Acknowledging an alarm will reset the alarm LED and remove the alarm from the active alarm list until it is activated again, an alarm should be acknowledged when the user has understood and take action according to the alarm triggered. Changing the acknowledgment method will allows the user to acknowledge either through : display, communication, or using the inputs.

Output type: the alarms can be associated to an output that will become active while the alarm is active too. The output used can be chosen between outputs.

Criticality: a level can be chosen for each alarm between INFORMATION, WARNING and CRITICAL, where this last one represents the highest level of criticality. This information will be registered in the alarm log.

NOTE: If using the "AUD - Audible alarm" output, it will only be active with the alarms set as CRITICAL.

There are different types of alarms on HZI855:

PARAMETERS: inside each one of the categories there can be different options like:

- V / U / F LOAD: Vsys (system avg phase to neutral voltage), F (frequency value), Uph OR (composed voltage phase-phase, counting any of the values), Uph AND (same but counting all 3 U values above limits U12 U23 and U31), Usys (composed voltage avg), Vph OR (same for phase to neutral voltages, counting any of the values V1 V2 V3), Vph AND (same but counting all of them), Vn (neutral voltage).
- V / U / F SOURCES: Vsys, Vunb (vectorial unbalance, based on phase and amplitude), F, Uph OR, Uph AND, Unba (absolute phase-phase unbalance, absolute amplitude value (no phase)), Usys, Uunb (vectorial unbalance on phase-phase voltages, based on phase and amplitude), Vph OR, Vph AND, Vn, Vnba (absolute unbalance, absolute amplitude value (no phase)).

MAINTENANCE ALARMS CONFIG: Allows the service (maintenance password required) to set up to 6 alarms of different or the same type.

MAINTEN. ALARMS HZI855	
ALARM ID	◀1▶
STATUS	DISABLED
ALARM TYPE	1
	CYCLES EXC.
UPPER THRESHOLD (Cycle)	5000
...	

- Cycles Exceeded: maximum number of operation cycles of the switch reached. A cycle considers going from one position to the opposite on and come back (for example I-II-I or I-off-II-off-I). By default it is set to 5 000 cycles.
- Operations Exceeded: maximum number of operations (change of position, including the off position (if existing) of the switching device. By default it is set to 10 000.
- Genset runtime S1 or S2: total amount of time that the genset has been working (supplying or not the load). Can be used for genset maintenance purposes. By default it is set to 900 000s (250h).
- Total time of genset supplying load on S1 or S2: total amount of time that the genset has been supplying the load. Can be used for genset maintenance purposes. By default it is set to 900 000s (250h).
- Inspection time: counts the time after the last inspection (entered in "Inspection Mode" of the maintenance menu). Can be used for periodic inspection/service purposes on the ATS. By default it is set to 300 months which is the maximum value. Hager recommends 12 months after servicing.

Consider there are also other parameters related to service (protected with Maintenance password too) inside the MAINTENANCE menu. See chapter 11.1.9.

LOGICAL ALARMS CONFIG: Permits up to 4 alarms using the inputs.

LOGICAL ALARMS HZI855	
ALARM ID	◀1▶
STATUS	DISABLED
ACK METHOD	NONE
INPUT TYPE	NONE
ACK INPUT	NOT USED
...	

SYSTEM ALARMS CONFIG: There are 6 system alarms that can be used to detect minor failures on the installation.

SYSTEM ALARMS HZI855	
ALARM TYPE	◀1▶
	PHASE ROTATION ERROR
STATUS	ENABLED
ACK METHOD	NONE
INPUT TYPE	NONE
...	

- PHASE ROTATION ERROR: If a change on phase rotation occurs, alarm will be activated.
- EXTERNAL ALARM: If an input is configured as External Alarm, this alarm will be activated when the input will be active.
- CONTROLLER UNAVAILABLE: If the controller loses the ability to perform the transfer functions this alarm will be activated (major fault or product inhibited).
- LOAD NOT SUPPLIED: If load is not supplied by any cause, this alarm can be activated if enabled.
- RTC LOW BATT: If the RTC battery has low battery and needs to be changed, this alarm will be active.
- DC AUX SUPPLY OUT OF LIMITS: If the DC auxiliary supply is out of limits (less than 10 VDC) this alarm will become active.

11.1.7. PASSWORDS

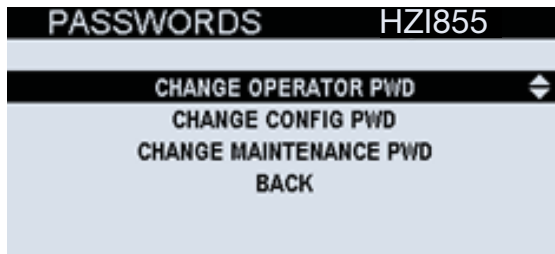
The controller considers there are 4 levels of user who can use it, so it uses 4 level of security:

- Standard user - it requires no password and it permits the visualization of the parameters and values measured by the controller. It is the level by default and if another user stays away from the controller for more than 5 minutes with no actions, the security level will become Standard user automatically.
- Operator - it requires the Operator password (by default 4000, can be changed in the Configurator level inside Parameters). It allows changing the operating mode, sending position orders to the switch and setting the engine exerciser parameters and alarms.
- Configurator - it requires the Configurator password (by default 1000, can be changed). It allows to change any configuration of the controller (operating range, timers, type of control, display settings, etc)
- Maintenance - It's the highest level of security. It requires the maintenance password (by default 1010) and it permits resetting counters, rebooting the device, changing and restoring passwords of other users and entering inspection date and telephone number.

Passwords by default (factory settings):

User (access to visualization)	No password
Operator (access to control functions)	4000
Configurator (access to parameter setting)	1000
Maintenance (access to service menu)	1010

These default passwords can be changed in the Parameters / Passwords menu (Configurator or Maintenance access).



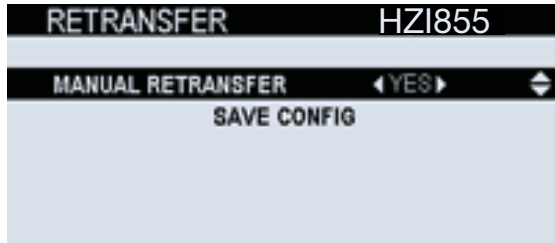
If the maintenance password is lost it cannot be restored. Please contact your Hager partner in case this operation is needed.

11.1.8. SPECIFIC FUNCTIONS Menu

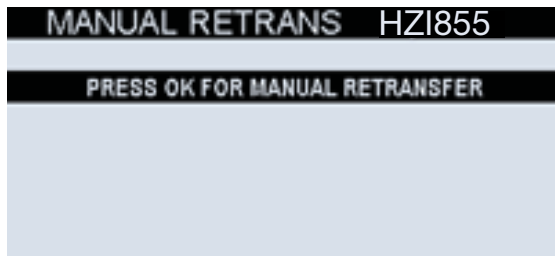
The controller integrates some specific functions that can be configured in this menu:

Manual retransfer

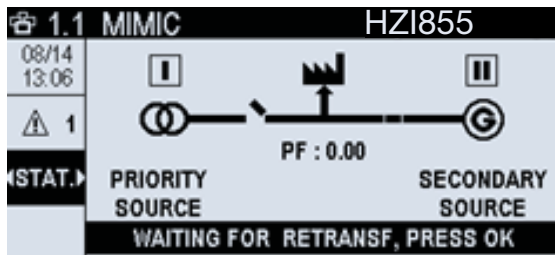
If this function is active ("YES"), when loads are supplied from the emergency source, the controller will not come back to the normal source when this one comes back until a confirmation order is received through the display or through an input (configured to do so). This applies also to TEST ON LOAD requests, a manual retransfer will be required to go back to the priority source.



Every time the Manual Retransfer is requested, a pop-up will appear on the screen allowing the user to act immediately or it can be dismissed and done any other time by using the menu CONTROL/MANUAL RETRANS:

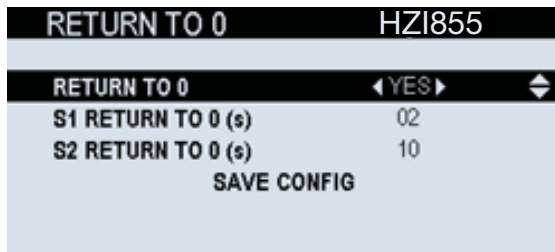


If the dashboard key is pressed on the keypad while manual retransfer is needed, there will be a bottom message line on screens 1.2 and 2.1 reminding the user that the retransfer approval is required.



Return to 0

This function allows the switch to go to center-off position (only typologies with 0 or center-off position) when both sources are lost or not available (supply to the load is not good enough due to undervoltage, phase lost, overvoltage, frequency out of limits,...). It can be used to avoid providing bad quality energy to the loads but also to avoid the power ramp and transients that may occur before the source is stable to go to the loads, as some loads might be sensitive to these events.



Associated timer to configure:

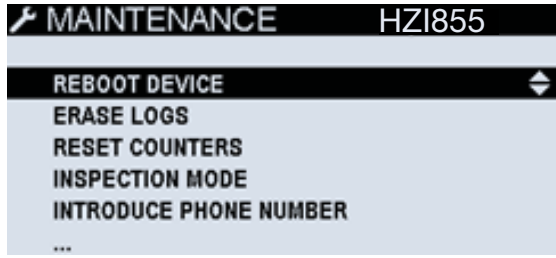
- RETURN TO 0 (s) (independent for S1 and for S2): time to wait before going to center-off / zero position after losing a source. (starts counting at same time than the failure timer).



This function will only work if both the switch and the controller are still supplied (by an external source, UPS or others, independent from the emergency and normal source).

11.1.9. Maintenance Menu

The maintenance menu permits to perform service-reserved actions on the controller:



REBOOT DEVICE: permits a software reboot on the controller without erasing any information.

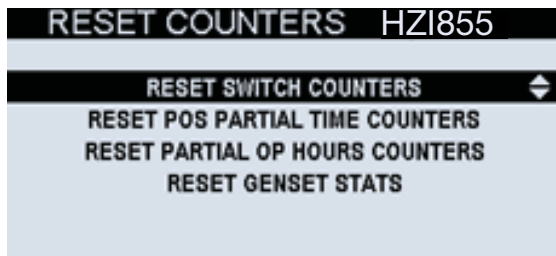
A confirmation request will pop up when pressing OK on the function.



ERASE LOGS: erases the event log or the alarm log. A second confirmation will be required.

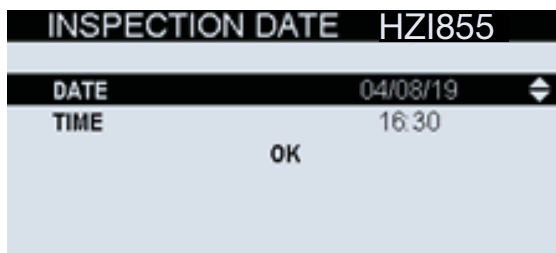


RESET COUNTERS: resets to 0 the counter values (switch, time in position, operational hours or genset statistics)

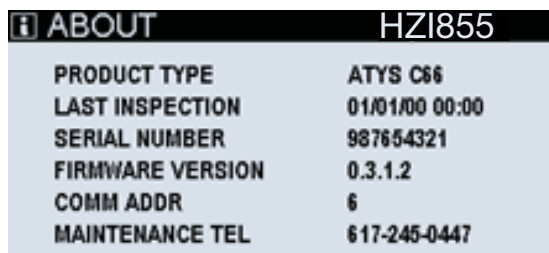


INSPECTION MODE: after servicing the product, this menu can be used to add the last inspection date/time.

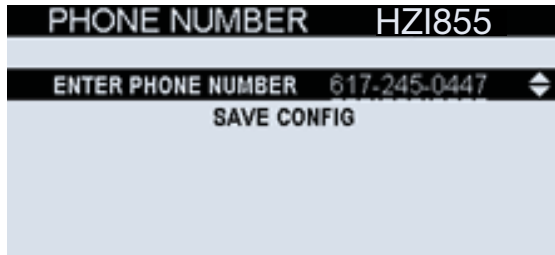
This information can be consulted on the main menu / ABOUT section by all the users.



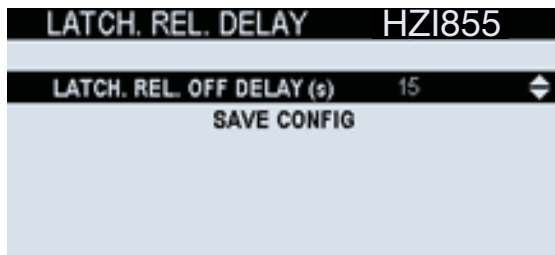
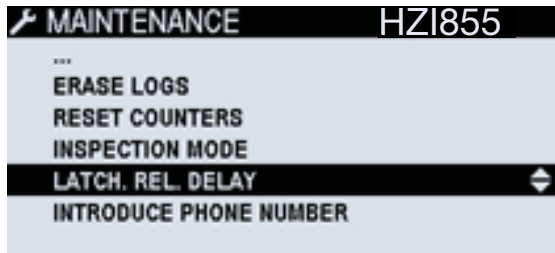
>



INTRODUCE PHONE NUMBER: a phone number can be introduced to appear on the ABOUT screen as the maintenance phone number, so in case there is an urgency, the operator in front of the controller can quickly check the phone number to make a call to the person in charge / supplier.



Latching relay OFF Delay: HZI855 has no energy backup. However, there is a function to delay the closing of the latching relays (OUT 5 & 6) after a few seconds from the loss of supply. This value (in seconds) can be configured in this maintenance menu.



Inside the parameters there are alarms reserved for services (only accessible with the maintenance password) access path: PARAMETERS / ALARMS / MAINTEN. ALARMS. This allows the service to set up to 6 alarms of different or the same type.

The options are:


- Cycles Exceeded: maximum number of operation cycles of the switch reached. A cycle considers going from one position to the opposite on and come back (for example I-II-I or I-off-II-off-I). By default it is set to 5 000 cycles.
- Operations Exceeded: maximum number of operations (change of position, including the off position (if existing) of the switching device. By default it is set to 10 000.
- Genset runtime S1 or S2: total amount of time that the genset has been working (supplying or not the load). Can be used for genset maintenance purposes. By default it is set to 900 000s (250h).
- Total time of genset supplying load on S1 or S2: total amount of time that the genset has been supplying the load. Can be used for genset maintenance purposes. By default it is set to 900 000s (250h).
- Inspection time: counts the time after the last inspection (entered in "Inspection Mode" of the maintenance menu). Can be used for periodic inspection/service purposes on the ATS. By default it is set to 300 months which is the maximum value. As standard, Hager recommends 12 months maximum between servicing.

For more information about alarm configuration, see chapter 11.1.6.

12. Maintenance

12.1. About the controller

All the main information about the controller can be directly found inside the **ABOUT** menu, accessible through the main menu of the controller:

 ABOUT	HZI855
PRODUCT TYPE	HZI855
LAST INSPECTION	01/01/00 00:00
SERIAL NUMBER	19102010011R6000066*
FIRMWARE VERSION	1.0
COMM ADDR	6
MAINTENANCE TEL	+33 000 000 000


- **PRODUCT TYPE:** Model of the product.
- **LAST INSPECTION:** This date is modified in the MAINTENANCE MENU / INSPECTION MODE by the service team by adding the new INSPECTION DATE after servicing the product for the first time. If there is no modification of this parameter, by default it will show "01/01/00 00:00".
- **SERIAL NUMBER:** Serial number of the product. The number can also be found on the top marking of the product as "N° S/N" followed by a number. This number might be asked by Hager service team whenever technical support is required.
- **FIRMWARE VERSION:** Version of the controller firmware. This will only change in case of a product firmware upgrade, done by an authorised Hager service team.
- **COMM ADDR:** Modbus RTU communication address for the controller. It can be set through the wizard or inside the COMMUNICATION parameters (see chapter 11.1.5)
- **MAINTENANCE TEL:** This value is configurable inside the MAINTENANCE menu / INTRODUCE PHONE NUMBER option to integrate inside the ABOUT menu a phone number by the user related to the maintenance of the product.

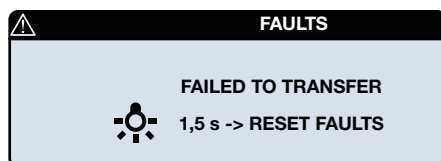
12.2. Faults management and Troubleshooting

There are several events that can cause a Fault on the controller. Unlike the alarms, the faults are not user-selectable, they will always be considered and actions will take place as follows:

Fault	Description (cause)	Actions	Acknowledge / Cleared	Fault log	Pop-up	Fault LED	Output
Unexpected Transfer	The controller receives a feedback/return from the switch without sending any order (auto or manu). Also if loss feedback of current position.	Mode stays the same. Controller will start retries if position is unknown. If a position is reached, no retry takes place.	Can also be cleared through display or through RST - Reset Fault input.	Yes	Yes, "Unexpected Transfer"	BLINKS (priority)	FLT - Fault active
Failed to Transfer	Position not reached after an order sent by controller (auto or manu) or loss of feedback of the new source after sending a transfer command.	Mode stays the same. Controller will start retries.	Automatically cleared if the requested position is reached or cleared through display or through RST - Reset Fault input.	Yes	Yes, "Failed to transfer"	BLINKS (priority)	FLT - Fault active
Max operation per minutes reached	If the controller performs 10 operations in less than 1 minute (by default) (automatic or controlled/manual)	Mode stays the same. During a timer, the controller will not do or allow any operation.	Automatic after the 1 minute (configurable through software) (value is dynamic).	Yes	Yes, "Max operations per minutes reached"	FIXED (non-critical)	FLT - Fault active
Max password attempts reached	User tries to enter a profile password more than X times set in the maintenance menu (by default 10 attempts)	Mode stays the same. Can't enter any password during X time set in the maintenance menu (by default 2 minutes)	Automatic after the set timeout (maintenance mode).	Yes	Yes, "Max number of tries reached, please wait: X s"	FIXED (non-critical)	FLT - Fault active
Genset Failstart	Controller tries to start a genset (as configured) and after the genset start delay, the genset doesn't start (controller doesn't see the source on)	Mode stays the same. Genset start relay remains active unless other source is available.	Automatic if genset starts or if source is set as Main/Utility.	Yes	Yes, "Engine fail to start"	BLINKS (priority)	FLT - Fault active
External fault	If an input is selected as FTE - External Fault and becomes active	Switch goes to position 0 / center-off directly without timers and the mode is set to Partial Inhibit (genset starts if needed).	Input mustn't be active and reset by user is requested (by RST- Reset Fault input or through display.	Yes	Yes, "External fault"	BLINKS (priority)	FLT - Fault active

For faults with pop-up, the pop-up will be cleared when fault will be cleared or by pressing any button on the front face of the controller. The total number of faults logged on the controller is dynamic, as the total number of "faults + alarms" is 100 (not including the events, which are 300) and uses a FIFO ordering.

To clear Faults through the display, it is possible inside the LOG/FAULTS menu with the option "PRESS OK TO CLEAR FAULTS", using the configurator profile password (1000). There is also a shortcut by holding the  button for 1.5s and validating on the pop-up that appears. If the fault is still active, it will be inside the log "in progress" but the fault LED and output will be off. If the faults are not active any more, they will be logged in the "history" log. This way to clear the fault will be automatically proposed by the controller through a pop-up:



12.3. Maintenance of the controller

To clean the front face of the equipment, use a soft cloth with water and non-abrasive liquids.

The HZI855 controller is conceived to be a maintenance free, fit and forget unit. However, it is recommended to perform visual inspections periodically on the device, checking the connections, that the display screen is functional and the LED using the lamp test button and ensuring the correct functioning with the switching device and with any possible associated software.

As a best practice, perform at least one full cycle with your equipment (solution with the controller + RTSE) every year.

RTC Battery replacement

Depending on the working and environmental conditions conditions the battery will need to be replaced when the controller displays a message "RTC LOW BATT". Should the time & date at power up be incorrect it will be time to replace the battery.

To do so:

1. Disconnect all terminals from the controller.
2. Release the cover on the side of the controller containing the battery.
3. Remove the old battery with an appropriate plastic tool.
4. Place the new battery on the correct side (polarity) in the holder from the pcb and push with the finger until it reaches the position of the old one.
5. Put back the plastic cover on the side of the controller and pressure slightly until it perfectly fits.
6. Connect back the terminals to the controller.
7. Power up and adjust time and date.

For battery replacement, use a BR2032 coin-type cell.

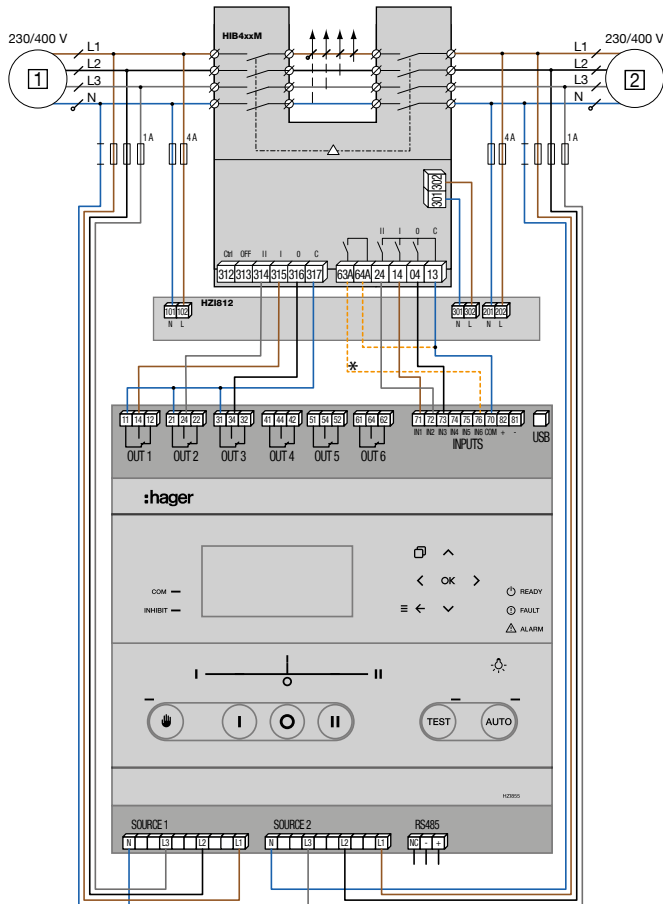
13. Annexes

13.1. Annex I: Wiring Diagrams

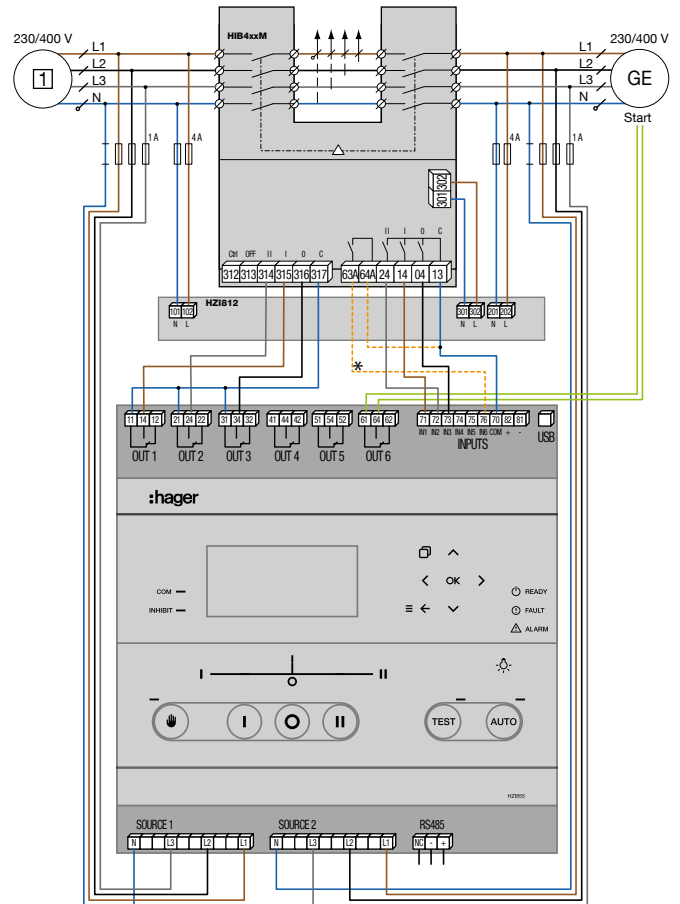
The below diagrams detail the connections of the HZI855 with HIB4xxM motorised changeover switches as well as the generic wiring diagram for circuit breakers.

HZI855 and HIB4xxM

for network / network application type



for network / genset application type



Default configuration for Inputs and Outputs for "HIB4xxM" mode:

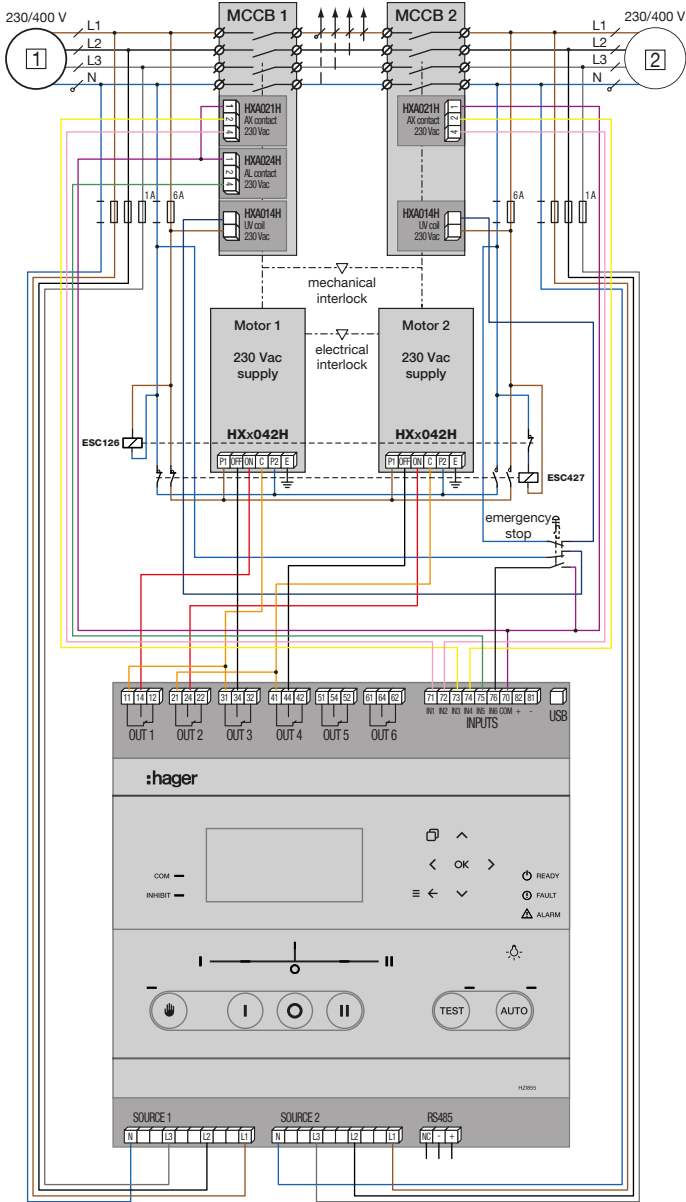
- IN1: Switch is in position 1
- IN2: Switch is in position 2
- IN3: Switch is in position 0
- IN4: Inhibit
- IN5: Manual retransfer
- IN6: RTSE in manual

- OUT1: Order to switch in position 1
- OUT2: Order to switch in position 2
- OUT3: Order to switch in position 0
- OUT4: S1 Available
- OUT5: S2 Available
- OUT6: Order to start Genset

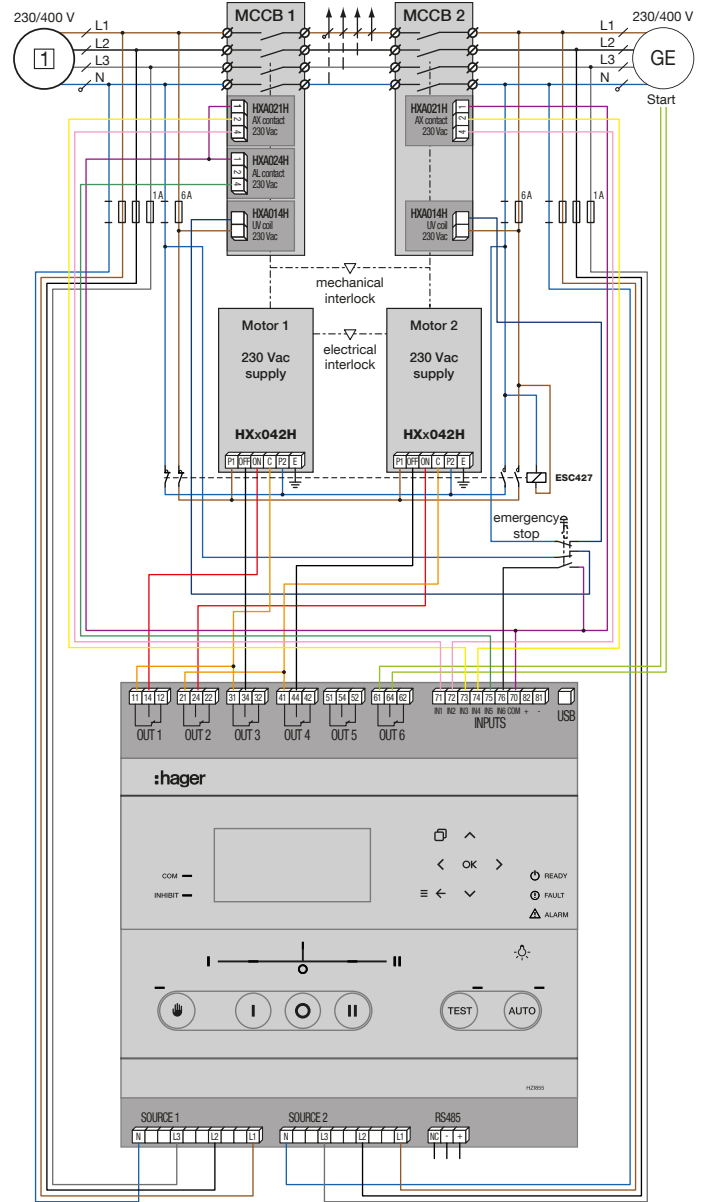
* The use of this input is optional, when used IN6 should be configured to "COVER OPEN" in mode "NC".

HZI855 with MCCB

for network / network application type



for network / genset application type



Note: indicated references are used for MCCB x250/P250 and x630/P630.

Default configuration for Inputs and Outputs for "Breaker" mode:

- IN1: Breaker 1 is in position ON
- IN2: Breaker 2 is in position ON
- IN3: Breaker 1 is in position OFF
- IN4: Breaker 2 is in position OFF
- IN5: Breaker 1 is in position TRIP
- IN6: Emergency stop

- OUT1: Order to close Breaker 1
- OUT2: Order to close Breaker 2
- OUT3: Order to open Breaker 1
- OUT4: Order to open Breaker 2
- OUT5: NONE
- OUT6: Order to start Genset

This configuration is defined with source 1 as the priority source. This diagram covers most application cases, the inputs and outputs are configured by default for this installation, the actions of the controller will be:

- In the event of neutral loss from source 1: the undervoltage coil will trip the circuit breaker for source 1 making it unavailable (ALarm contact on input 5) to switch to secondary source 2.
- In the event of tripping via the emergency stop button: the undervoltage coil will trip the circuit breaker of the source 1 making it unavailable (ALarm contact on input 5) BUT the controller will switch to "total inhibition" (input 6 activated), that is to say that the load will no longer be supplied without manual intervention on the controller in order to acknowledge this fault.

After acknowledgment, the controller will switch to priority source 1 if available, otherwise to secondary source 2.

13.2. Annex II: Timers list

These options can be configured in the Parameters / Timers menu:

Operation timers

Trigram	Timer	Description	Selectable range	By default
1FT	S1 FAILURE TIMER (s)	Source 1 Failure Timer: When source 1 is considered lost, 1FT is started. If source 1 is considered restored before the end of 1FT, the changeover sequence will not be engaged.	0 ... 60 s	3 s
1RT	S1 RETURN TIMER (s)	Source 1 Return Timer: When source 1 returns, 1RT is started. At the end of 1RT, source 1 is then considered to be present. Should source 1 disappear before the end of 1RT, the changeover will not be carried out. In case the alternate source disappears during 1RT, a dynamic 3 second delay will override the 1RT time setting value. ⚠ NOTE: this timer is only available in MM (MAIN - MAIN) applications. In other applications, the timer is replaced by the AVAILABILITY TIMER (1AT).	0 ... 3 600 s	180 s
2FT	S2 FAILURE TIMER (s)	Source 2 Failure Timer: When source 2 is lost, 2FT is started. If source 2 is restored before the end of 2FT, the changeover sequence is not started.	0 ... 60 s	3 s
2RT	S2 RETURN TIMER (s)	Source 2 Return Timer: When source 2 returns, 2RT is started. At the end of 2RT, source 2 is then considered to be present. Should source 2 disappear before the end of 2RT, the changeover will not be carried out. ⚠ NOTE: this timer is only available in MM (MAIN - MAIN) applications. In other applications, the timer is replaced by the AVAILABILITY TIMER (2AT).	0 ... 3 600 s	5 s
1AT / 2AT	S2/S1 AVAILABILITY TIMER (s)	Source (1/2) Available Timer: Stabilisation time delay for voltage and frequency on Source (1/2). 1/2AT starts as soon as the source voltage is above the hysteresis value. Transfer to Source 2 may be done at the end of this time delay. ⚠ NOTE: this timer is only available in MG and GG (main-genset or genset-genset) applications. In MM applications, the timer is replaced by the RETURN TIMER (1RT and 2RT).	0 ... 3 600 s	180 s
DBT1 / DBT2	S1 or S2 DEAD BAND TIMER (s)	Dead Band Timer: This is the minimum electric dead time (blackout time) to respect when the source is lost or when transferring between source. This defines the minimum load supply downtime so as to allow residual voltages that may be generated by the load (such as motors) to decay.	0 ... 20 s	3 s

Genset timers

Trigram	Timer	Description	Selectable range	By default
1CT / 2CT	S1/S2 GENSET COOLDOWN (s)	Source 1 or 2 (Genset) Cool Down Timer: Following a return to priority source sequence, the genset on backup source is kept running for the 1CT/2CT timer duration. This is intended to cool down the genset (off load) before switching off.	0 ... 600 s	180 s
1ST / 2ST	S1/S2 START TIMEOUT (s)	Source 1 or 2 Genset start timeout delay: This time delay is started as soon as the genset start signal is given. Should source 1 or 2 not become available after timer 1ST/2ST has elapsed a "Fail start" error message is displayed on the product LCD.	0 ... 600 s	30 s



In order to ensure a good operation, make sure that 1ST and 2ST timers are longer than 1AT and 2AT. Otherwise there will be a fault appearing on the screen saying "GENSET FAIL TO START". This is due to the fact that the genset will always take longer to become available.

Test ON load timers

Trigram	Timer	Description	Selectable range	By default
TOT (lim/unlim)	TEST ON LOAD	Test on load limited/unlimited	-	UNLIMITED
TOT	TEST ON LOAD (s) - TIME / DURATION	Test On Load Duration Timer: This timer defines the On Load Test time. It starts counting when the Test is initiated. The return to the main supply takes place at the end of TOT. Note: TOT is configurable when TOT (LIM/UNL) above is set to LIM.	0 ... 21 600 s	10 s
T3T	TEST ON LOAD END (s)	Test On Load - End Delay Timer: This time delay starts counting at the end of TOT Timer. The return to the main supply takes place at the end of T3T time.	0 ... 1 800 s	5 s
E1T	EXT TEST ON LOAD PRE (s) / BEFORE	External Order Test Off Load - Start Delay Timer. This time delay starts at the same time as the External On Load (EFL) order is received. At the end of this time delay, the Genset start order is activated. The load will not be transferred to the Genset supply.	0 ... 1 800 s	5 s
E2T (lim/unlim)	EXT TEST ON LOAD	External Test on load limited/unlimited	-	UNLIMITED
E2T	EXT TEST ON LOAD (s) - TIME / DURATION	External Order Test On Load - Duration Timer: This timer starts counting when the Test is initiated. The return to the main supply may initiate at the end of E2T time. Note: E2T duration timer is configurable in the timers menu when at least 1 input is configured as EOL and with E2T (UNL/LIM) set to UNL.	0 ... 21 600 s	10 s
E3T	EXT TEST ON LOAD POST (s) / AFTER	External Order Test On Load - End Delay Timer: This time delay starts counting at the end of E2T Timer. The return to the main supply takes place at the end of E3T time.	0 ... 1 800 s	5 s

Test OFF load timers

Trigram	Timer	Description	-	By default
TFT (lim/unlim)	TEST OFF LOAD	Test off load limited/unlimited	-	UNLIMITED
TFT	TEST OFF LOAD (s) - TIME / DURATION	Test Off Load - Duration Timer: This time delay defines the On Load Test time. It starts counting when the Test is initiated. The return to the main supply takes place at the end of TFT. Note: TFT is configurable in the timers menu when TFT (LIM/UNL) above is set to LIM.	0 ... 21 600 s	600 s
E5T	EXT TEST OFF LOAD PRE (s) / BEFORE	External Order Test On Load - Start Delay Timer. This time delay starts at the same time as the External On Load Test (EOL) order is received. At the end of this time delay, the Genset start order is activated. Once source supply 2 is available, the load is transferred to source supply 2.	0 ... 1 800 s	5 s
E6T (lim/unlim)	EXT TEST OFF LOAD	External Test off load limited/unlimited	-	UNLIMITED
E6T	EXT TEST OFF LOAD (s) - TIME / DURATION	External Order Test Off Load - Duration Timer: This timer starts counting when the Test is initiated.	0 ... 21 600 s	600 s
E7T	EXT TEST OFF LOAD POST (s) / AFTER	External Order Test On Load - End Delay Timer: This time delay starts counting at the end of E6T Timer. The Genset signal will switch at the end E7T.	0 ... 1 800 s	5 s

Specific functions timers

Function	Trigram	Timer	Description	Selectable range	By default
Return to 0	10T / 20T	S1 or S2 RETURN TO 0 (s)	Return to 0 timer: If no source available, time before going to 0 when "return 0" active from the source (S1 or S2)	0 ... 10 s	2 s

13.3. Annex III: Inputs list

These options can be configured in the Parameters / I/O / Inputs menu:

Trigram	Input name	Description
AC1	SWITCH IN POS 1	Read position 1 from the RTSE
AC2	SWITCH IN POS 2	Read position 2 from the RTSE
AC0	SWITCH IN POS 0	Read position 0 from the RTSE
AC0A	SWITCH A IN POS.0	Read position 0 from the SWITCH on S1
AC0B	SWITCH B IN POS.0	Read position 0 from the SWITCH on S2
MAN	COVER OPEN / MANUAL MODE	Not in auto, cover open: This input is connected to the switch to inform the controller that the switch is in maintenance mode (door is open for servicing). The controller commands will be inhibit but navigation through the menu and dashboards on the display are allowed. This situation will remain until the input is cleared.
LCK	PADLOCKED	Product padlocked. Message on screen "PADLOCKED", meaning that the RTSE has been padlocked. Controller goes to Inhibit mode until input is cleared. The controller commands will be inhibit but navigation through the menu and dashboards on the display are allowed.
POP	RTSE AVAILABLE	Information coming from the RTSE to inform that the RTSE is operational.
PS1	GO TO POS 1	External order to go to pos 1 Position command only available if the mode is in position CTRL. The last command received has priority.
PS2	GO TO POS 2	External order to go to pos 2 Position command only available if the mode is in position CTRL. The last command received has priority.
PS0	GO TO POS 0	External order to go to pos 0 Position command only available if the mode is in position CTRL. Command 0 has priority over commands I and II.
RT0	RETURN TO 0	Overrides the "Return to 0" function inside SPECIFIC FUNCTIONS
BLK	BLOCKED	Product blocked, meaning that the RTSE is blocked, can't move. The controller will go into Partial Inhibition (starting the genset if necessary) but not transferring. Message on the display "PRODUCT BLOCKED"
TP1	TRIP BRK 1	Protection on S1 has tripped
TP2	TRIP BRK 2	Protection on S2 has tripped
EST	EMERGENCY SIGN	Emergency off signal. Controller will pilot to go to position 0 (if any). CTRL will be disabled, AUTOMATIC mode will be off, genset won't be started, "Emergency Off" will be displayed on screen. If Lift/Elevator signal is enabled, its timers will be respected before giving the command to go to 0.
BCT	BYPASS TIMER	Bypass timer: Bypasses the current timer on the screen / first one of the list of timers running.
-	NONE	INPUT NOT USED
INH	INHIBIT	Inhibition of the automatism. Mode inhibition (not automatic). CTRL is permitted. Genset won't start if the source is lost
INHp	PARTIAL INHIBITION	Inhibition of the automatism. Mode inhibition (not automatic). CTRL is permitted. Genset will start if the source is lost to ensure the supply of the controller, but it will not transfer.
INHt	TOTAL INHIBITION	Inhibition of the automatism. Mode inhibition (not automatic). CTRL is NOT permitted. Genset won't start if the source is lost
TON	TEST ON LOAD	Start test on load with dedicated test on load timers
TOF	TEST OFF LOAD	Start test off load with dedicated test on load timers
EON	EXT. LOAD	Remote on load test: If set to UNLIMITED, this order will start the cycle to transfer and the controller will not send an order to go back to preferred source until the signal is cleared. If set to LIMITED, a pulse on the input will start the test that will follow the E2T and other timers.
EOF	EXT. NO LOAD	Remote off load test: If set to UNLIMITED, this order will start the genset and stop the genset according to the external test off load configuration inside the parameters. If set to LIMITED, a pulse on the input will start the test that will follow the configured timers.
MRT	MANUAL RETRANS	Manual Retransfer to priority source (touching keypad or via INPUT) Remote transfer back to the priority source: This is the same function as "MANUAL RETRANSFER" cleared with the keypad. This variable in the PARAMETERS/SPECIFIC FUNCTIONS menu must be enabled to validate the operation through this input.

PRI	CHANGE PRIO	Changes the priority between sources
SS1	BYPASS STAB S1	Bypasses the stabilisation timer for S1
SS2	BYPASS STAB S2	Bypasses the stabilisation timer for S2
ALE	EXT ALARM	External alarm active. It will be logged in the alarm log as External Alarm and the Alarm LED will be active. The alarm will be In progress until input is cleared
FTE	EXT FAULT	External fault active. The product will transfer to position 0 / center off. CTRL is permitted. Mode will be inhibit. Genset will not start if source is lost. "EXTERNAL FAULT" will be displayed on screen. It will be logged in the fault log as External Fault and the Fault LED will be active. The fault will be In progress until input is cleared and fault reset.
MSR	PRIO TEST ON LOAD	EJP / Stay on "backup" source. Priority Test on Load. Order to stay in S2 even if the source is lost or unavailable.
OA1	FORCE S1 AVAIL.	Force Source 1 as Available
OA2	FORCE S2 AVAIL.	Force Source 2 as Available
OU1	FORCE S1 UNAVAIL.	Force Source 1 as Unavailable
OU2	FORCE S2 UNAVAIL.	Force Source 2 as Unavailable
RST	RST FAULT STATE	Fault Reset: This input may be used to reset a fault condition after the fault has been cleared. Faults may also be reset through communication or through the display.
CHP	CHANGE PRIO	Changes the position (if no priority defined). It partially inhibits when active. It goes back to Auto when cleared. It has to be a permanent maintained input, it can't be an impulse.

13.4. Annex IV: Outputs list

These options can be configured in the Parameters / I/O / Inputs menu:

Trigram	Output name	Description
PO1	POS 1 ORDER	Switch position order to go to Source 1
PO2	POS 2 ORDER	Switch position order to go to Source 2
PO0	POS 0 ORDER	Switch position order to go to Source 0
PA0	POS 0 ORDER S1	Switch position order to go to center-off (source 1)
PB0	POS 0 ORDER S2	Switch position order to go to center-off (source 2)
S1A	S1 AVAILABLE	Source 1 available: Output activated if source 1 is considered as available (see conditions of availability in the dedicated chapter of the manual).
S2A	S2 AVAILABLE	Source 2 available: Output activated if source 2 is considered as available (see conditions of availability in the dedicated chapter of the manual).
SCA	ANY SOURCE AVAIL	Source 1 OR source 2 available: This output is activated when at least one source (S1 or S2) is available.
S1U	S1 UNAVAIL	Source 1 unavailable: Output activated if source 1 is not considered as available (see conditions of availability in the dedicated chapter of the manual) or the source has been inhibited.
S2U	S2 UNAVAIL	Source 2 unavailable: Output activated if source 2 is not considered as available (see conditions of availability in the dedicated chapter of the manual) or the source has been inhibited.
AC1	S1 CLOSED	Source 1 closed: This output has the function of an auxiliary contact. When the controller has the input from the switch to be in source 1, the output will be active. This also considers the case where with no real information about the position, the controller works in blind mode.
AC2	S2 CLOSED	Source 2 closed: This output has the function of an auxiliary contact. When the controller has the input from the switch to be in source 2, the output will be active. This also considers the case where with no real information about the position, the controller works in blind mode.
AC0	OFF POSITION	Both sources open (center-off): This output has the function of an auxiliary contact. When the controller has the input from the switch to be in center-off, with both switches open, the output will be active. This also considers the case where with no real information about the position, the controller works in blind mode.
FLT	FAULTS ACTIVE	At least 1 fault is active on the controller. Fault report
ROS	(EXT) TEST ON LOAD	This output is activated if any load test (either HMI or remote order) is ongoing.
ARO	CRIT. ALM. ACTIVE	This alarm output will be active in the case that one of the alarms set in the Alarms menu is active and the option to use the output to report the alarm is enabled.
-	NONE	OUTPUT NOT USED
GS1	GENSET S1 START	Genset start/stop output. Only available on OUT 5 when the source is a generator (when configured as Genset/ Genset) or on OUT 6 (when configured as Main/Genset with priority on S2).
GS2	GENSET S2 START	Genset start/stop output. Only available on OUT 6 when the source is a generator.



Position orders should not be used with the OUT 5 and OUT 6 (latching relays).
The latching relays can take up to 2 seconds between opposite orders (NO to NC or NC to NO) and for added security when starting a genset will change state based on the timers or when the backup power is exhausted.

13.5. Annex V: Technical characteristics

Mechanical features	
Casing type	Fitted on a door (160x220) or back-plate
Case material	PC (Polycarbonate)
Protection degree	IP30 - IP65 with gasket in accessory, ref. HZI501 (IP20 rear panel)
Screen resolution	350x160 pixels - 8 lines of text
Weight	1085 g (controller without spare parts)
AC Power	
Rated voltage	120/208/230/240/277/400/480 VAC
Operating limits	88 ... 576 VAC
Frequency	50/60 Hz +/-10 %
Drawn/Dissipated power	< 10 W
Recommended fuses	1 A gG
DC Power	
Rated battery voltage	9 ... 28 VDC
Reverse polarity protection	yes
Maximum drawn current	3 A peak < 10 ms
Recommended fuses	2 A gG
Voltage sensing	
U _e max. Rated voltage	480 VAC
U _i (according 60947-1)	600 VAC
Measuring range limits	50 ... 576 VAC
Frequency range limits	45 ... 66 Hz
Measurement type	True RMS (TRMS)
Sample rate	9,6 kHz
Measurement input impedance	6 MΩ
Accuracy (V, U)	0,5 %
Accuracy (f)	0,1 %
Digital Inputs	
Input type	Dry contacts
Input signal delay	<200 ms
Outputs OUT 5-6	
Output type	latching / form C relay
Operating time	< 30 ms
Contact type	Volts free configurable NO/NC
Rating	AC1 8 A 277 VAC 50/60 Hz AC15 2 A 277 VAC 50/60 Hz DC1 8 A 24 VDC
Outputs OUT 1-4	
Output type	Non-Latching type
Operate time	< 30 ms
Contact type	Volts free configurable NO/NC
Rating	AC1 8 A 277 VAC 50/60 Hz AC15 2 A 277 VAC 50/60 Hz DC1 8 A 24 VDC
RTC	
Battery type	Coin type cell (BR2032)
Battery voltage	3 V
Battery lifetime (Average, depends on usage conditions)	6 years

RS485	
Interface type	2 to 3 half duplex wires
Protocol	MODBUS RTU
Baudrate	programmable 1200 ... 115200 bps
Function	Configuration and data reading
Isolation	Functional
Maximum distance	1200 m @9600 baud 200 m @115200 baud
Termination	internal 120 ohms (selectable DIP switch)
Environmental specifications	
Ambient operating temperature	-30° ... +70° C
Storage temperature	-40° ... +70° C
Operating humidity	55°C / 95 % HR
Operating altitude	< 2000 m
Vibrations	IEC 60947-1
Shocks	shocks according to Annex Q IEC 60947-1
EMC classification	Class A+B
Insulation / Overvoltage cat.	
Impulse V withstand	U _{imp} = 4 kV. Test = 8 kV between sources / 6 kV between phases
Installation overvoltage category	OVC III
Degree of pollution	Pollution degree 3
USB	
Connection	USB 2
Type	Type B Micro USB
Mechanical characteristics	
Height*length*depth	240x180x64 mm
Weight	1085 g
Event recorder	
Capacity	300 events + 100 alarms
Data storage	non-volatile memory
Type tests - All the EMC tests are described in the sequence 4 947-1	
Electrostatic Discharge Immunity - Air	8 kV (B)
Electrostatic Discharge Immunity - Direct	4 kV (B)
Radiated RF Immunity	10 V/m
Electrical Fast Transient / Burst Immunity	2 kV power access, 1 kV signal access
Surge Immunity	1 kV diff
Conducted RF Immunity	10 V _{rms}
Radiated RF Emission	Class B
Conducted RF Emission	Class B
Case	
Fire reaction of housing and cover	self-extinguishing UL94-V0
Service life components	
MTBF	> 100 years

13.6. Annex VI: Full menu architecture

MENU	SUBMENU 1	SUBMENU 2	SUBMENU 3
DASHBOARD (not in menu)	MIMIC STATUS METERING TIMERS ALARMS I/O MAINTENANCE		
CONTROL PWD: 4000	MODE / POSITION	MODE CHANGE POSITION GENSET SOURCE 1 GENSET SOURCE 2	
	TEST	TEST ON LOAD TEST OFF LOAD	
	MANUAL RETRANSFER		
LOG PWD: 1000	EVENT LOG		
	ALARM LOG	IN PROGRESS HISTORY	
	FAULT LOG	IN PROGRESS HISTORY	
STATISTICS	CYCLES	OPERATING HOURS CYCLE CNT TOT CYCLES IN AUTO CNT TOT CYCLES IN MANU CNT	
	OPERATIONS	OPERATION CNT TOT OPERATIONS IN POS 0 TOT OPERATIONS IN POS 1 TOT OPERATIONS IN POS 2	
	OPERATING HOURS	OP HOURS CNT OP HOURS PARTIAL CNT	
	SOURCE 1	TOT TIME S1 PARTIAL TIME S1 LAST SWITCH S1 TOT TIME S1 ON LOAD	
	SOURCE 2	TOT TIME S2 PARTIAL TIME S2 LAST SWITCH S2 TOT TIME S2 ON LOAD	
	GENSET 1	GENSET 1 ACTIVE DURATION GENSET 1 ON LOAD DURATION GENSET 1 ACTIVATION CNT	
	GENSET 2	GENSET 2 ACTIVE DURATION GENSET 2 ON LOAD DURATION GENSET 2 ACTIVATION CNT	
	BREAKER	TOTAL TRIP BRK1 TOTAL TRIP BRK2 DATE OF LAST TRIP BRK1 DATE OF LAST TRIP BRK2	

MENU	SUBMENU 1	SUBMENU 2	SUBMENU 3
GENSET SCHEDULER PWD: 4000	GENERAL PARAMETERS	GENSET IDLE TIMEOUT (min) SAVE CONFIG	
	CUSTOM 1	TYPE SET PERIODIC SCHEDULE TEST DURATION (s) START DATE START TIME END DATE END TIME	
PARAMETERS PWD: 1000	NETWORK	AUTODETECT	
		SETUP	NETWORK TYPE NOMINAL VOLTAGE NOMINAL FREQUENCY PHASE ROTATION PHASE ROTATION CHECK VT USED VT PRIMARY VT SECONDARY SAVE CONFIG
		APPLICATION	SWITCH TECHNOLOGY APPLICATION TYPE SOURCE 1 NAME SOURCE 2 NAME SOURCE PRIORITY LOGIC TEST ON LOAD PRIO EXT TEST ON LOAD PRIO RETRY NUMBER RETRY DELAY (ms) PULSE LENGTH (ms) SAVE CONFIG
		OP RANGE S1	S1 OV FAIL (%) S1 OV RESTORE (%) S1 UV FAIL (%) S1 UV RESTORE (%) S1 UB FAIL (%) S1 UB RESTORE (%) S1 OF FAIL (%) S1 OF RESTORE (%) S1 UF FAIL (%) S1 UF RESTORE (%) SAVE CONFIG
		OP RANGE S2	S2 OV FAIL (%) S2 OV RESTORE (%) S2 UV FAIL (%) S2 UV RESTORE (%) S2 UB FAIL (%) S2 UB RESTORE (%) S2 OF FAIL (%) S2 OF RESTORE (%) S2 UF FAIL (%) S2 UF RESTORE (%) SAVE CONFIG

MENU	SUBMENU 1	SUBMENU 2	SUBMENU 3	
PARAMETERS PWD: 1000	DISPLAY	SCREEN	LANGUAGE INTENSITY TIMEOUT (s)	
		DATE AND TIME	DATE FORMAT DATE SEPARATOR DATE TIME	
		OPTIONS	TEST BUTTON USE LAMP TEST DURATION (s) POPOP DISPLAYED	
		CHANGE PRODUCT NAME	ATS NAME	
		SCREENSAVER TEXT	TEXT POLICE LINE 1 TEXT LINE 2 TEXT LINE 3 TEXT LINE 4 TEXT PREVIEW DEFAULT LOGO SAVE CONFIG	
	TIMERS	OPERATION	S1 FAILURE (s) S1 RETURN (s) S2 FAILURE (s) DEAD BAND (s) SAVE CONFIG	
		GENSET SOURCE 1	S1 GENSET COOLDOWN (s) S1 START TIMEOUT (s) SAVE CONFIG	
		GENSET SOURCE 2	S2 GENSET COOLDOWN (s) S2 START TIMEOUT (s) SAVE CONFIG	
		TESTS ON LOAD	TEST ON LOAD TEST ON LOAD (s) TEST ON LOAD END (s) EXT TEST ON LOAD PRE (s) EXT TEST ON LOAD EXT TEST ON LOAD (s) EXT TEST ON LOAD POST (s) SAVE CONFIG	
		TESTS OFF LOAD	TEST OFF LOAD TEST OFF LOAD (s) EXT TEST OFF LOAD PRE (s) EXT TEST OFF LOAD EXT TEST OFF LOAD (s) EXT TEST OFF LOAD POST (s) SAVE CONFIG	

MENU	SUBMENU 1	SUBMENU 2	SUBMENU 3
PARAMETERS PWD: 1000	I/O	INPUTS	INPUT 1 INPUT 2 INPUT 3 INPUT 4 INPUT 5 INPUT 6 INPUT 1 TYPE INPUT 2 TYPE INPUT 3 TYPE INPUT 4 TYPE INPUT 5 TYPE INPUT 6 TYPE SAVE CONFIG
		OUTPUTS	OUTPUT 1 OUTPUT 2 OUTPUT 3 OUTPUT 4 OUTPUT 5 OUTPUT 6 OUTPUT 1 TYPE OUTPUT 2 TYPE OUTPUT 3 TYPE OUTPUT 4 TYPE OUTPUT 5 TYPE OUTPUT 6 TYPE SAVE CONFIG
		MODBUS ADDRESS	ADDRESS SAVE CONFIG
		RS458 MODBUS	BAUDRATE STOP PARITY SAVE CONFIG
	COMMUNICATIONS		

MENU	SUBMENU 1	SUBMENU 2	SUBMENU 3
PARAMETERS PWD: 1000	ALARMS	LOGICAL ALARMS CONFIG	ALARM ID STATUS LOGICAL INPUT ACK METHOD ACK INPUT OUTPUT REPORT CRITICITY
		MAINTENANCE ALARMS CONFIG	ALARM ID STATUS TYPE UPPER THRESHOLD ACK METHOD ACK INPUT OUTPUT REPORT CRITICITY
		SYSTEM ALARMS CONFIG	ALARM ID STATUS ACK METHOD ACK INPUT OUTPUT REPORT CRITICITY
	PASSWORD	CHANGE OPERATOR PWD CHANGE CONFIG PWD CHANGE MAINTENANCE PWD BACK	
	WIZARD	START WIZARD CONFIG?	
	MANUAL RETRANSFER	MANUAL RETRANSFER	
	RETURN TO 0	RETURN TO 0 S1 RETURN TO 0 (s) S2 RETURN TO 0 (s) SAVE CONFIG	
SPECIFIC FUNCTIONS PWD: 1000	POWER UP IN AUTO	POWER UP IN AUTO	
	LOAD ADDING	STATUS PRE TRANSFER TIMER (s) ON DELAY 1 TIMER (s) ON DELAY 2 TIMER (s) ON DELAY 3 TIMER (s) SAVE CONFIG	
	CYCLER	STATUS TRANSFER METHOD S1 CYCLER DURATION (h) S2 CYCLER DURATION (h) TRANSFER TIME PRIO SELECTION SAVE CONFIG	

MENU	SUBMENU 1	SUBMENU 2	SUBMENU 3
MAINTENANCE PWD: 1010	REBOOT DEVICE		
	MAX OPERATIONS	MAX OPERATIONS DELAY SAVE CONFIG	
	ERASE LOGS	RESET ALARM LOG RESET EVENT LOG	
	RESET COUNTERS	RESET SWITCH COUNTERS RESET POS PARTIAL TIME COUNTERS RESET PARTIAL OP HOURS COUNTERS RESET GENSET 1 STATS RESET GENSET 2 STATS RESET BREAKER 1 COUNTERS RESET BREAKER 2 COUNTERS	
	INSPECTION DATE	DATE TIME	
	LATCH. REL. DELAY	LATCH. REL. OFF DELAY (s) SAVE CONFIG	
	INTRODUCE PHONE NUMBER	ENTER PHONE NUMBER SAVE CONFIG	
ABOUT (no PWD)	PRODUCT NAME LAST INSPECTION SERIAL NUMBER FIRMWARE VERSION COMM ADDR MAINTENANCE TEL		

13.7. Annex VII: Communications table

Find your product Modbus communication registers online at : <http://hgr.io/r/hzi855>

