ENGLISH

STAR3

Energy & Harmonics Analyser

USER MANUAL
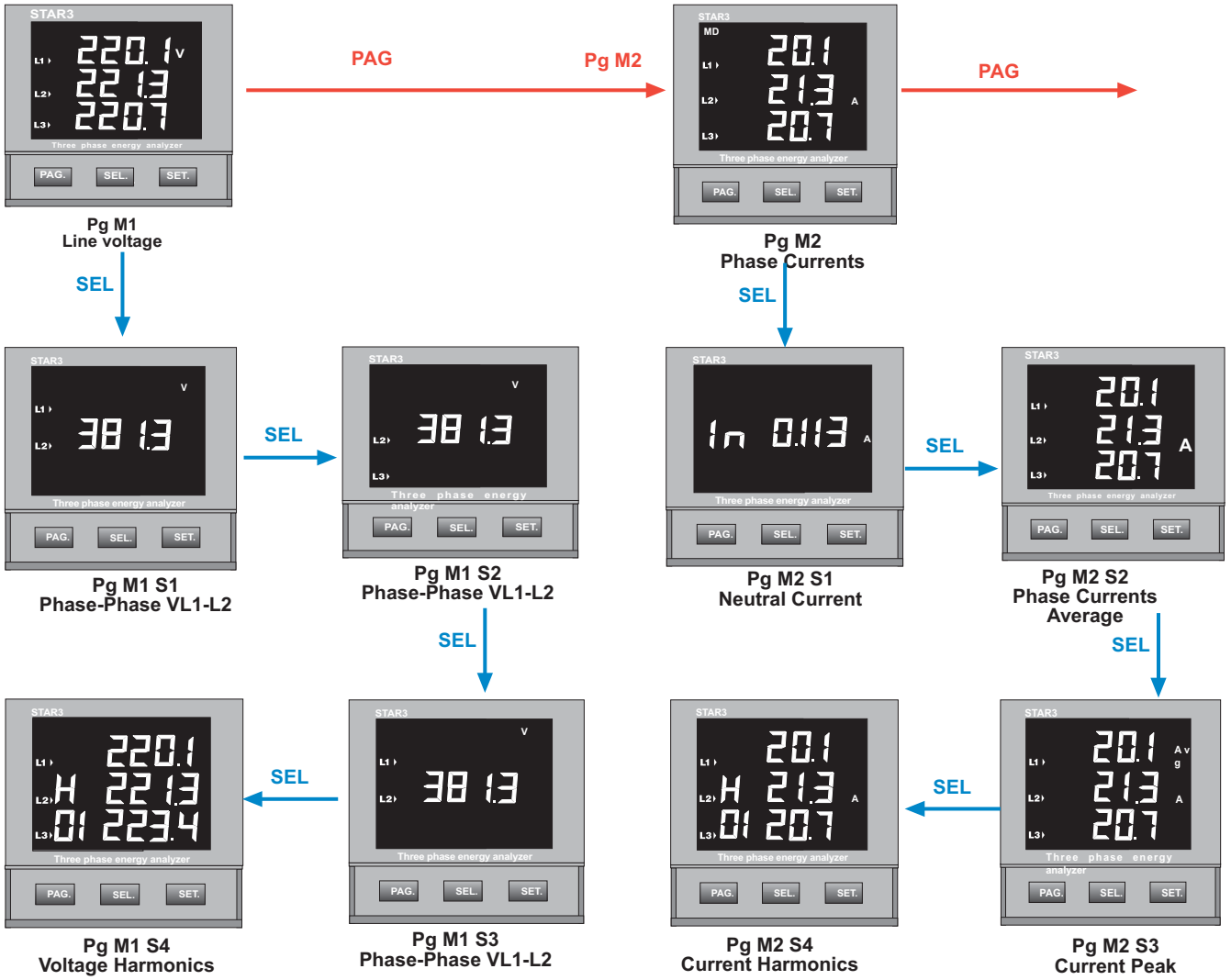
3YYYB106 STAR3 User Manual Eng Rev. 02/2005

STAR3

The pages of this diagram are available in 3PH-N mode.
In 3PH, 2PH and 1PH some pages will disappear.

32 PH and N

| TOT kVArh kWh | --SEL→ | COG lVArh kWh |

TOT kVAh kWh

| TOT VA VAr W | --SEL→ | Avg VA VAr W | --SEL→ | Peak VA VAr W |

TOT VA PF Hz

TOT V A W

| THD Avg V A | --SEL→ | THD V L1 L2 L3 | --SEL→ | THD A L1 L2 L3 |

PF1 PF2 PF3

VAr1 VAr2 VAr3

VA1 VA2 VA3

W1 W2 W3

| A1 A2 A3 | --SEL→ | A-Neutral | --SEL→ | Peak Current | --SEL→ | A1 Avg A2 Avg A3 Avg | --SEL→ | A Harmonics (*) |

| VL1-N VL2-N VL3-N | --SEL→ | VL1-L2 | --SEL→ | VL2-VL3 | --SEL→ | VL3-L1 | --SEL→ | V Harmonics (*) |

(*) Harmonics model only

MEASURES PAGES

Pg M1
Line voltage
L1	220.1 V
L2	221.3
L3	220.7

PAG → Pg M2 → PAG →

Pg M2
Phase Currents
MD	20.1
L1	21.3 A
L2	
L3	20.7

SEL ↓ (below Pg M1)

SEL ↓ (below Pg M2)

Pg M1 S1
Phase-Phase VL1-L2
L1	V
L2	381.3

SEL →

Pg M1 S2
Phase-Phase VL1-L2
L2	V
L3	381.3

SEL ↓

Pg M2 S1
Neutral Current

In 0.113 A

SEL →

Pg M2 S2
Phase Currents Average
L1	20.1
L2	21.3 A
L3	20.7

SEL ↓

Pg M1 S4
Voltage Harmonics
L1	220.1
L2 H	221.3
L3 01	223.4

← SEL

Pg M1 S3
Phase-Phase VL1-L2
L1	V
L2	381.3

Pg M2 S4
Current Harmonics
L1	20.1
L2 H	21.3 A
L3 01	20.7

← SEL

Pg M2 S3
Current Peak
L1	20.1 A v g
L2	21.3 A
L3	20.7

STAR3 — Three phase energy analyzer — PAG. SEL. SET.

MEASURES PAGES

Pg M3
Phase Active Power

PAG Pg M7 →

Pg M6
Phase Power factor

PAG →

Pg M7
Averange THD V and A

PAG →

Pg M8
3ø - V - A- W

PAG →

PAG ↓

PAG ↑

SEL ↓

Pg M4
Phase Apparent Power

PAG ↓

Pg M7 S1
Phase THD V

SEL ↓

PgM5
Phase Reactive Power

PgM7 S2
Phase THD A

MEASURES PAGES

Pg M9
3ø-VA-PF-Hz three-phase

PAG

Pg M10
3ø - VA- VAr-W

PAG **Pg M11**

Pg M11
3ø Energy Couters
VAh - VAr-W

PAG

Pg M12
3ø Energy Couters
VAh - VAr-W

PAG

SEL

Pg M10 S1
3ø - Averange Powers
VA- VAr-W

SEL

Pg M12 S1
3ø Cogeneration Couters
VArh - Wh

SEL

Pg M10 S2
Maximum Demand
Power
VA- VAr-W

Password setup pages

PAG+SEL
(for 30 sec the first time)

Pg S0
Insert Setup password

PAG

Pg S0a
Change or confirm password
VA - VAr - W

PAG

Go to Setup

SETUP MENU - ALL MODELS

PAG+SEL

STAR3

```
100  v
---
100
```
Three phase energy analyzer

PAG. SEL. SET.

Pg S1
VT ratio

PAG →

STAR3

```
005
---
005  A
```
Three phase energy analyzer

PAG. SEL. SET.

Pg S2
CT ratio

PAG →

STAR3

```
Int.
t
15
```
Three phase energy analyzer

PAG. SEL. SET.
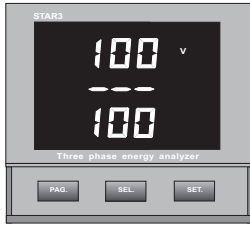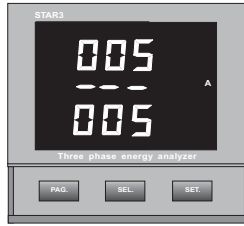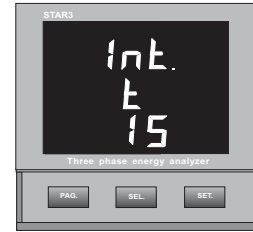
Pg S3
Integration period
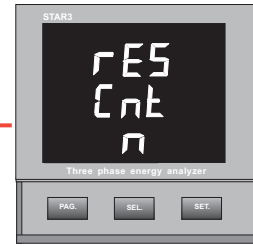
PAG ↓
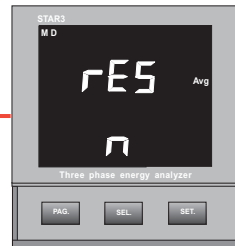
STAR3

M D
```
rES

n        Avg
```
Three phase energy analyzer

PAG. SEL. SET.

Pg S5
Reset Avg and Peak

← **PAG**

STAR3

```
rES
Cnt
n
```
Three phase energy analyzer

PAG. SEL. SET.

Pg S4
Reset couters

STAR3

```
COG
On
```
Three phase energy analyzer

PAG. SEL. SET.

Pg S6
Cogeneration

← **PAG**

PAG ↓

STAR3

```
3PH
And
n
```
Three phase energy analyzer

PAG. SEL. SET.

Pg S7
Connection type

PAG →

STAR3

```
96
n
bCd
```
Three phase energy analyzer

PAG. SEL. SET.

Pg S8
Setup Rs485

PAG →

STAR3

```
Add
001
```
Three phase energy analyzer

PAG. SEL. SET.
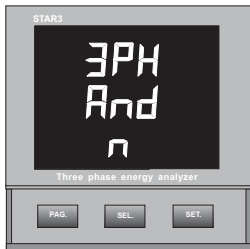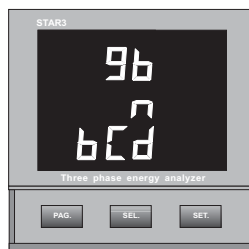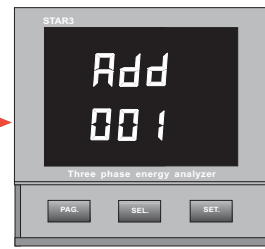
Pg S9
Rs485 address

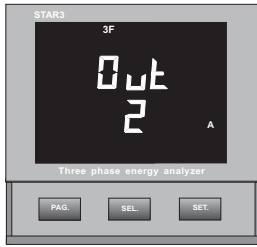**PAG** →

SETUP MENU - ADDITIONAL PAGES FOR MODELS 4-20MA
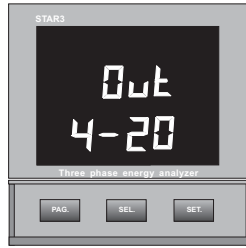
Pg S10 4-20mA
Output range

PAG

Pg S12 4-20mA
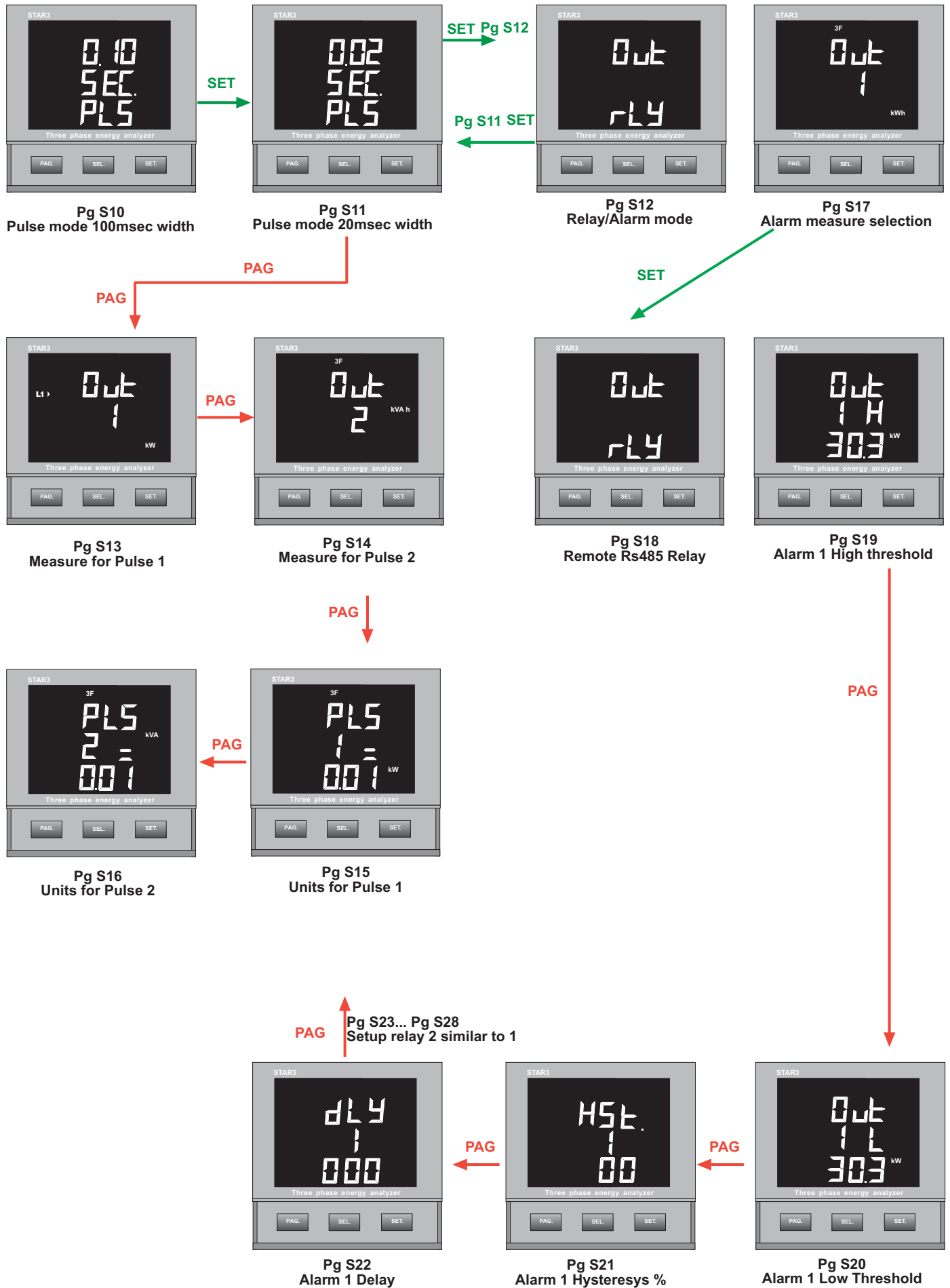**Measure for output 2 selection**

PAG
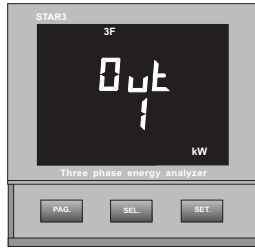
Pg S11 4-20mA
Measure for output 1 selection

PAG
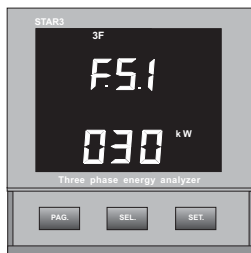
Pg S13 4-20mA
Full scale output 1

PAG
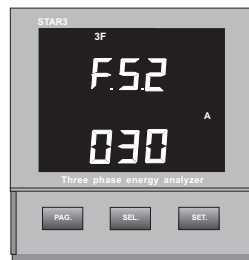
Pg S14 4-20mA
Full scale output 2

SETUP MENU - ADDITIONAL PAGES FOR MODELS ALM AND HARMO

Pg S10
Pulse mode 100msec width

Pg S11
Pulse mode 20msec width

Pg S12
Relay/Alarm mode

Pg S17
Alarm measure selection

Pg S13
Measure for Pulse 1

Pg S14
Measure for Pulse 2

Pg S18
Remote Rs485 Relay

Pg S19
Alarm 1 High threshold

Pg S16
Units for Pulse 2

Pg S15
Units for Pulse 1

Pg S23... Pg S28
Setup relay 2 similar to 1

Pg S22
Alarm 1 Delay

Pg S21
Alarm 1 Hysteresys %

Pg S20
Alarm 1 Low Threshold

SET   Pg S12

Pg S11   SET

SET

PAG

PAG

PAG

PAG

PAG

PAG

PAG

SET

PAG

PAG

PAG

MEASURES CONNECTION DIAGRAMS

3 PH

2 PH

3 PH (2CT)

3 PH-N

VOLTAGE   **CURRENT**   **POWER SUPPLY** 90-230 V AC/DC

VL3 VL2 VL1 N A3 A2 A1 COM

1 2 3 4 5 6 7 8 9 11

L3 L2 L1

3 PH (2PT)

VOLTAGE   **CURRENT**   **POWER SUPPLY** 90-230 V AC/DC

VL3 VL2 VL1 N A3 A2 A1 COM

1 2 3 4 5 6 7 8 9 11

L1 N   S1 S2

1 PH
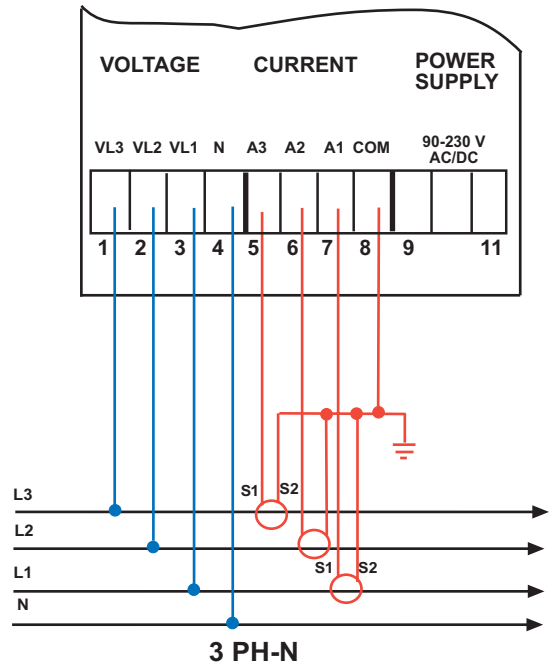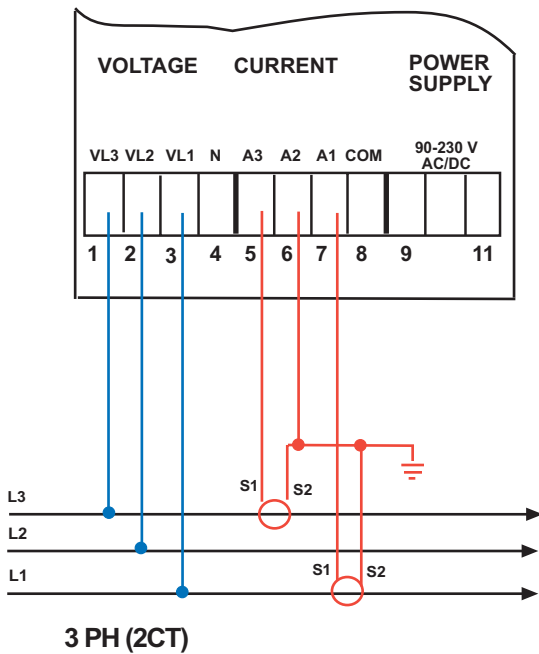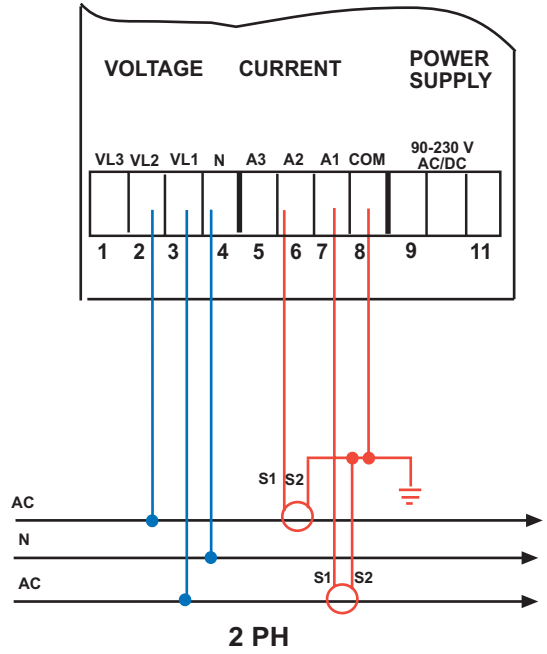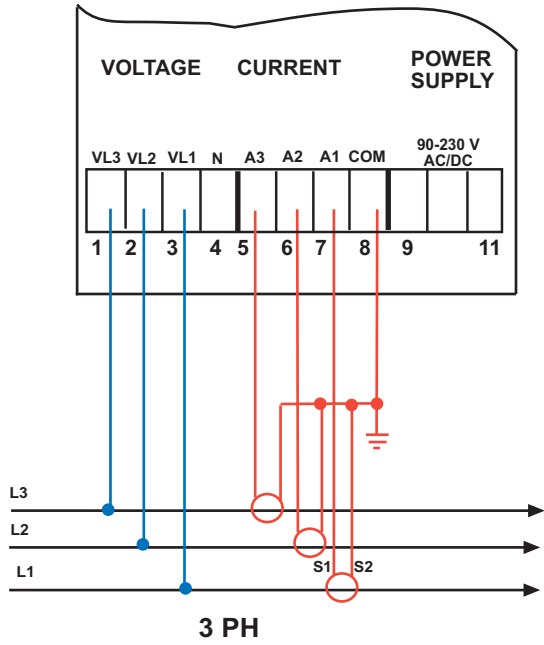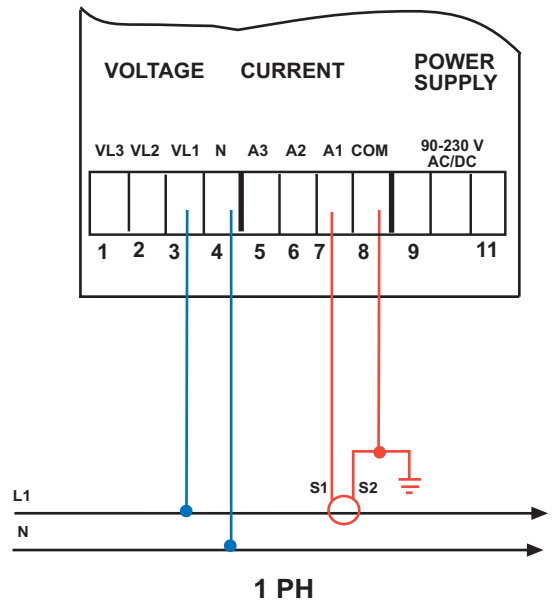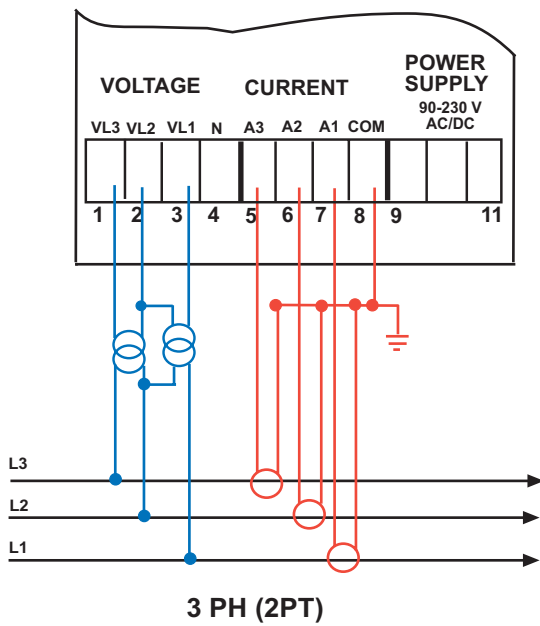
⚠️ **NOTE:** The secondery side of the PT is not grounded. Further protection may be required.

POWER SUPPLY CONNECTION DIAGRAMS

VOLTAGE   **CURRENT**   **POWER SUPPLY**

VL3 VL2 VL1 N A3 A2 A1 COM ∿ 115V 230V

1 2 3 4 5 6 7 8 9 11

230VAC → Fuse 100 mAT
115VAC → Fuse 200 mAT
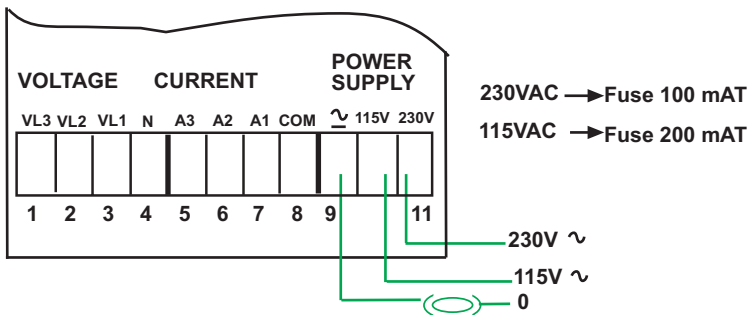
230V ∿
115V ∿
0

**STAR3 models with AC power supply.
Discontinued at the end of 2004**

VOLTAGE   **CURRENT**   **POWER SUPPLY** 90-230V AC/DC

VL3 VL2 VL1 N A3 A2 A1 COM

1 2 3 4 5 6 7 8 9 11

90VDC → Fuse 400 mAT
115VAC → Fuse 400 mAT
230VAC → Fuse 100 mAT

90-230 V AC/DC
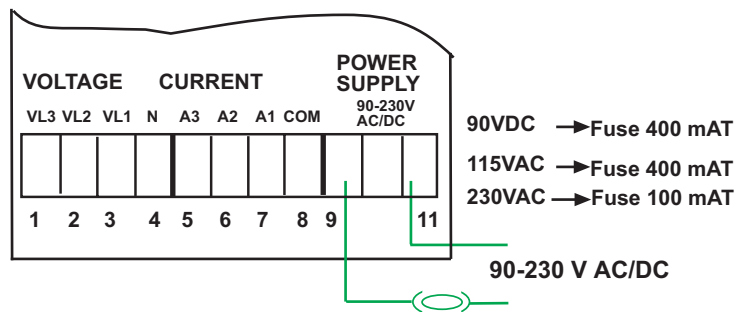
STAR3 with switching power supply

DISPLAYED MEASUREMENT

PARAMETERS	TOT	L1	L2	L3	N
Phase-neutral Voltage [V]	•	•	•	•	
Phase-phase Voltage [V]		L1-L2	L2-L3	L3-L1	
Current [A]	•	•	•	•	•
Power Factor	•	•	•	•	
Frequency [Hz]		•			
Average Current [A]		•	•	•	
Maximum Demand Current [I]	•	•	•	•	
Active Power [kW]	•		•	•	
Reactive Power [kvar]	•	•	•	•	
Apparent Power [kVA]	•	•	•	•	
Average Active Power [kW]	•				
Average Reactive Power [kvar]	•				
Average Apparent Power [kVA]	•				
Maximum Demand Active Power [kW]	•				
Maximum Demand Reactive Power [kvar]	•				
Maximum Demand Apparent Power [kVA]	•				
Positive (Imported) Active Energy [kWh]	•				
COG-negative (Exp.) Active Energy [kWh]	•				
Positive Reactive Energy [kvarh]	•				
COG-negative Reactive Energy [kvarh]	•				
Apparent Energy [kVAh]	•				
Current Thd%	•	•	•	•	
Voltage Thd%	•	•	•	•	

Model HARMO .(1250Hz max order)

HARMONIC ORDER (k=1..25 @ 50Hz - k=1..20 @ 60Hz)	L1	L2	L3
Harmonic Voltage Vk	•	•	•
Harmonic Current Ik	•	•	•

DIMENSIONS
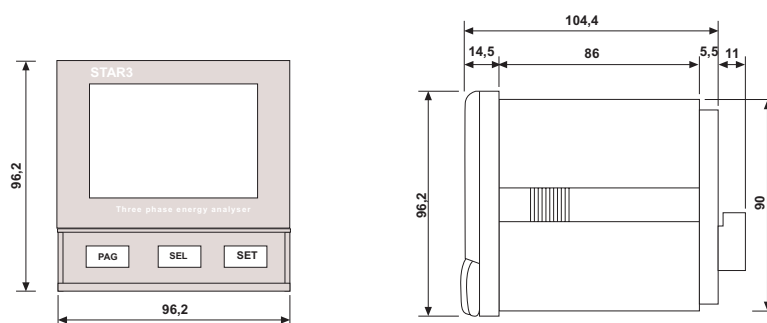
1 - INTRODUCTION

⚠ Please read carefully the instructions with this symbol before installing and using the instrument.

1.1 - ⚠ STANDARDS and REGULATIONS
STAR3 conforms to Directive 73/23/CEE (LVD) and 2004/108/CE (EMC).
It has been designed with reference to EN 61010-1, EN 61326 including append. A1/A2/A3, EN 61000-6-2, EN 61000-6-3, EN 61000-3-2, EN 61000-3-3, EN 61000-3-3/A1, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-5/A1, EN 61000-4-6, EN 61000-4-6/A1, EN 61000-4-8, EN 61000-4-8/A1, EN 61000-4-11, EN 61000-4-11/A1.

1.2 - ⚠ USER SAFETY
In order to preserve these safety conditions and ensure safe operation, the user must observe all instructions and marks specified in this user manual. All maintenance and repair operations requiring the opening of the instrument must be carried out <u>only</u> by suitably qualified and authorised personnel. The instrument was shipped from the manufacturing plant in perfect technical safety conditions.

1.3 - ⚠ PRELIMINARY INSPECTIONS
Before installation, check that the instrument is in good conditions and was not damaged during transport. Check that the network voltage and the rated voltage coincide. This instrument does not require an earth connection.

1.4 - ⚠ PRECAUTIONS IN THE EVENTS OF MALFUNCTIONS
When safe operation is no longer possible, put the instrument out of service and ensure that it cannot be operated accidentally. Safe operation cannot be guaranteed in the following circumstances:
·   When the instrument appears clearly damaged.
·   When the instrument no longer works.
·   After long storage in unsuitable conditions.
·   After being damaged in transit.

2 - CONNECTION OF THE INSTRUMENT

2.1 - ⚠ POWER SUPPLY
The power supply connections terminals are located on the rear side and are clearly indicated with the label POWER SUPPLY. Use cables having a maximum section of 2.5 mm^2. Earth connection is not required. Follow the connection diagram at the beginning of the manual.

2.2 - ⚠ CONNECTING VOLTAGE MEASUREMENT CABLES
These cables, having a maximum section of 2.5 mm^2, are to be connected to the terminals labelled VOLTAGE INPUT as indicated in the diagrams at the beginning of the manual.

2.3 - ⚠ CONNECTING CURRENT MEASUREMENT CABLE
The instrument is able to measure up to 5A only through external C.T. The cables having maximum section of 2.5 mm^2 must be connected to the terminals labelled CURRENT INPUT as shown in the diagrams at beginning of the manual. Use Use 3 CT's with 5A secondary. Use cables having a section appropriate to the length of the connection and the rated power of the CT's used.
Note 1: For safety reasons, never leave the CT secondary open.
Note 2: <u>Important</u> direct connections, without C.T. will damage the inputs.

3 - PROGRAMMING THE INSTRUMENT
The instrument can be fully programmed by means of the SETUP menu. Press at the same time the PAG and the SEL keys to enter the SETUP . The complete description of the setup is available at chapter 5.

4 - MEASUREMENT PAGES
At power on, the STAR3 displays the last page selected before power off.
Use the PAG key to scroll through the different measurement pages and the SEL key to see the details.
The presence of several pages is depending on the connection mode selected into the setup .
3 PH-N: Three phases with neutral, i.e. Star , 4 wires system
3 PH: Three phases without neutral, i.e. Delta, 3 wires system
2 PH: Two phases and neutral
1 PH: Single phase

Page M1 (page and subpages not available in 1PH mode)
       Phase-neutral voltages   VL1-N, VL2-N, VL3-N   (3 PH-N, 3 PH)
       Phase-neutral voltages   VL1-N, VL2-N   (2 PH)
       ·Page M1-S1 (page appearing only in 3PH-N and 2 PH)
       Phase to Phase Voltage   VL1-L2
       ·Page M1-S2 (page appearing only in 3 PH-N)
       Phase to Phase Voltage   VL2-L3
       ·Page M1-S3 (page appearing only in 3 PH-N)
       Phase to Phase Voltage   VL3-L1
       ·Page M1-S4 (page appearing only in STAR HARMO. VL1 has to be connected)
       Harmonics Voltages   VL1$_h$, VL2$_h$, VL3$_h$
       Use the key SEL to scroll all the harmonics orders h .
       The maximum order is depending on the fundamental. It is the 25th at 50 Hz
       The voltage input are not connected the harmonics menu does not appear.

·Page M2 (page and sub pages not available in 1PH)
       Phase currents   A$_{L1}$, A$_{L2}$, A$_{L3}$ (3 PH-N, 3 PH)
       Phase currents   A$_{L1}$, A$_{L2}$ (2 PH)
       ·Page M2-S1 (present only in three 3PH-N; 3PH)
       Neutral current   A$_{neutral}$
       ·Page M2-S2
       Average Phase currents   AL1$_{Avg}$ AL2$_{Avg}$, AL3$_{Avg}$
       The integration time is the same used for the Average power and it is
       adjustable into the setup menu.
       ·Page M2-S3
       Phase current peaks   AL1$_{peak}$, AL2$_{peak}$, AL3$_{peak}$
       maximum average currents.
       ·Page M2-S4 (Page appearing only in STAR3 HARMO)
       Harmonics Currents   AL1$_h$, AL2$_h$, AL3$_h$
       Use the key SEL to scroll all the harmonics orders h .
       The maximum order is depending on the fundamental. It is the 25th at 50 H

·Page M3 (page not available in 1PH)
       Phase active powers (kW)   P$_{L1}$, P$_{L2}$, P$_{L3}$ (3 PH-N, 3 PH)
       Phase active powers   P$_{L1}$, P$_{L2}$ (2 PH)

·Page M4 (page not available in 1PH)
       Phase Apparent powers (kVA)   S$_{L1}$, S$_{L2}$, S$_{L3}$ (3 PH-N, 3 PH)
       Phase apparent powers   S$_{L1}$, S$_{L2}$ (2 PH)

·Page M5 (not available in 1PH)
       Phase reactive powers (kVAr)   Q$_{L1}$, Q$_{L2}$, Q$_{L3}$ (3 PH-N, 3 PH)
       Phase reactive powers   Q$_{L1}$, Q$_{L2}$,   (2 PH)

·Page M6 (not available in 1PH)
       Phase Power Factor   PF$_{L1}$, PF$_{L2}$, PF$_{L3}$ (3 PH-N, 3 PH)
       Phase reactive powers   PF$_{L1}$, PF$_{L2}$,   (2 PH)

·Page M7
       Average Total Harmonic Distortion Factors
       Avg THDV=   (THDV$_{L1}$+THDV$_{L2}$+THDV$_{L3}$)/3;
       Avg THDA=   (THDA$_{L1}$+THA$_{L2}$+THDA$_{L3}$)/3
       These special parameters allow to identify immediately if one of the phases is distorted

       .Page M7-S1 (not available in 1PH mode)
       Phase THD V   THDV1, THDV2 ; THDV3   (3 PH-N, 3 PH)
                                 THDV1,THDV2   (2 PH)
       e.g.: THDV1 =

$$\frac{\sqrt{\left(\sum_{h=2}^{25} V1_h^2\right)}}{V1_{rms}} = \frac{\sqrt{(V1_{rms}^2 - V1_{fnd}^2)}}{V1_{rms}}$$

       ·Page M7-S2 (not available in 1PH mode)
       Phase THD A   THDA1, THDA2 ; THDA3   (3 PH-N, 3 PH)
                                 THDA1, THDA2   (2 PH)
       e.g.: THDA1=

$$\frac{\sqrt{\left(\sum_{h=2}^{25} A1_h^2\right)}}{A1_{rms}} = \frac{\sqrt{(A1_{rms}^2 - A1_{fnd}^2)}}{A_{rms}}$$

·Page M8

Equivalent three-phase voltage	$V = (V_{L1-N} + V_{L2-N} + V_{L3-N}) / 3$	(3 PH-N)
Equivalent three-phase voltage	$V = (V_{L1-L2} + V_{L2-L3} + V_{L3-L1}) / 3$	(3 PH)
Phase to phase voltage	$V = V_{L1-N} + V_{L2-N}$	(2 PH)
Phase-Neutral voltage	$V = V_{L1-N}$	(1 PH)

Equivalent. three-phase current	$A = S / (3\ V)$	(3 PH-N, 3 PH)
	$A = S / V$	(2 PH)
	$A = A_{L1}$	(1 PH)

Total Active power (kW)	$P = P_{L1} + P_{L2} + P_{L3}$	(3 PH-N, 3P)
	$P = P_{L1} + P_{L2}$	(2 PH)
	$P = P_{L1}$	(1 PH)

·Page M9

Total Apparent power (kVA)	$S = (\ P^2 + Q^2)$
Power factor	$P.F. = P / S$
Frequency (of $V_{L1)}$	$f\ \ (Hz)$

·Page M10

Apparent power	S= repeated as page M9	
Total Reactive power (kVAr)	$Q = Q_{L1} + Q_{L2} + Q_{L3}$	(3 PH-N, 3 PH)
Total reactive power	$Q = Q_{L1} + Q_{L2}$	(2 PH)
Total Active Power	P= repeated as page M8	

·Page M10-S1
1- Average apparent power   S avg
2- Average reactive power   Q avg
3- Average active power   P avg
The integration time can be adjusted into the Setup menu
The average values can be reset into the Setup menu
·Page M10-S2
1-Maximum demand apparent power   S peak
2-Maximum demand reactive power   Q peak
3-Maximum demand active power   P peak
The peaks values can be reset into the Setup menu

·Page M11
Total apparent energy counter   kVAh
Total active energy counter   kWh
range 0,000,000.00-99,999,999.9   kWh.
When the upper limit is reached, the counter restarts from 00,000,000.0 kWh.
One decimal disappear definitively after the first roll-over. Reset the counter to display it again

·Page M12
Total reactive energy counter   kVArh
Total active energy counter   kWh
range 0,000,000.00-99,999,999.9   kWh.
When the upper limit is reached, the counter restarts from 00,000,000.0 kWh.
One decimal disappear definitively after the first roll-over. Reset the counter to display it again
·Page M12-S1
Cogeneration counters. This page is available only if the COG is enabled into the SETUP.
Total capacitive reactive energy   kVArh
Total exported active energy   kWh

To measure properly the cogeneration counters it is strictly necessary to connect the
 CTs oriented in the same direction. This is not required if the Cogeneration is OFF

5 - SETUP PAGES
To access the SETUP open the front door and press the PAG and the SEL keys at the same time:
Use the SEL key to select a digit or a setting. Use the SET key to adjust it.
The setup can be protected with a password (see next chapter)

·Page S1 Programming the Primary and Secondary ratio of a PT.
        Use a ratio equal to 1 (e.g. 100/100) in case of direct measurement without voltage transformer is not
        used. Select a digit with the SEL key; change its value using the SET key.

·Page S2 Programming the Primary and Secondary Windings of a Current Transformer
        Select a digit with the SEL key; change its value with the SET key.

·Page S3 : Integration time for Power and current averages, range 00-99min.
        Select a digit with the SEL key; change its value with the SET key.

·Page S4 Reset energy counters.
        If you select Y with the SET key, all the counters will be reset as soon you confirm by pressing the PAG.
        key.

·Page S5 Reset Averages and Maximum Demands, Power and current averages.
      If you select Y with the SET key, all the Averages and maximum demand values will be reset as soon you
      confirm by pressing the PAG. key.

·Page S6 Enable Cogeneration counters.
      Select ON or Off to enable the measures and confirm with PAG
      To measure properly the cogeneration counters it is strictly necessary to connect the
      CTs oriented in the same direction. This is not required if the Cogeneration is OFF

·Page S7 Programming connection type
      Select the type of system which you want to measure using the SET key.

·Page S7a	3 PH	Three phases without neutral (i.e. Delta)
·Page S7b	3 PH And n	Three phases with neutral (i.e. Star)
·Page S7c	2 PH	Two-phases with neutral
·Page S7d	1 PH	Single phase with neutral

·Page S8 : Rs485 communication parameters setup
      Baud Rate: (3 top digits) can have the following values: 2.4, 4.8, 9.6, 19.2 (kbaud)
      The Parity (central) value can be : N (none), O (odd), E (even).
      The type of communication protocol Modbus (3 bottom digits) can be:
      ASCII = Modbus ASCII. This format is limited to simulate the same data frame of the Vip Energy.
      BCD = Modbus BCD. It allows the full control of the instrument
      IEEE = Modbus IEEE standard, INTEL format

·Page S9 Rs485 instrument address
      The Modbus address of the instrument can be set in this page.
      The permitted address field ranges between 1 and 247.

The page S9 is the last one of the basic model STAR3 family.
Other pages will follow only if the STAR3 is equipped with the options HARMO, ALM, 4-20mA

6 - SET-UP PAGE PROTECTION CODE

By default, the access code to set-up pages is not enabled. To enable it, keep the PAG + SEL keys pressed simultaneously
for 30 sec. The display will show the page on which the access code must be entered.
·Page S0 enter setup password
      By means of the SEL + SET keys, every digit can be changed and the code can be entered. The initial
      factory code , that must be entered the first time is 000000.
      Confirm and exit from this page by pressing the PAG key.
·Page S0a – modify password
      Now a second page (with "COD" blinking), identical to the first one, is displayed:
      From this page, the access code can be permanently changed, if wished.
      In this case remember or make a safe note of the new code somewhere you can find it later on.
      To exit from the second page press the PAG key.

IMPORTANT: After the first access to the password page, the request of the code will become permanent.
From that moment on the code must be always entered to access the set-up page.
Avoid to recall the password page, for test purposes, if the code request is not permanently desired.

SETUP PASSWORD MEMO	
STAR3 SERIAL'#	
INSTALLED AT	
FACTORY PASSWORD	000000
DATE	
NEW PASSWORD	
DATE	
NEW PASSWORD	
DATE	
NEW PASSWORD	

7 – ADDITIONAL SETUP PAGES FOR MODELS STAR3 HARMO and ALM

To access Programming Mode, open the front door and press the PAG and the SEL keys at the same time. Use the SEL key to select a digit or a setting. Use the SET key to adjust it.
The setup can be protected with a password (see chapter 6)

·Page S10- Pulses with length 100 msec
       Enable Pulse mode with pulse length of 100 msec
       Press PAG to confirm . Press SET for selection, 20 msec (S11). RLY (S12).

·Page S11 - Pulses with length 20 msec
       Enable Pulse mode with pulse length of 20 msec .
       Press PAG to confirm. Press SET for the next selection (go to S16)

·Page S12- ALM
       The confirmation of this page enable the remote relay control or the alarm mode.
       Press PAG to confirm
       Press SET to go to the pulse mode (go to S10).

PULSE OUTPUT

·Page S13- Measure corresponding to output 1 .
       Pressing the SET key enables to select the measure corresponding to output 1:
       kWh tot
       kWh tot COG
       kVArh tot
       kVArh tot COG
       kVAh tot
·Page S14 - Measure corresponding to ouput 2.
       Pressing the SET key enables to select the measure corresponding to output 2.
       The measure available are the same of page S12 for output 1.

·Page S15 - Weight of 1 pulse output 1
       Number of kWh corresponding to 1 pulse.
       E.g.: 1 pulse = 0.01 kWh
       Pressing the SEL key to select the digit to modify.
       Pressing the SET key to adjust the selected digit to modify.
       Pressing the PAG key enables to go to output 2 pulse weight set-up.

·Page S16 - Weight of 1 pulse output 2.
       Same as S14 for output 2.
       This is the last page of the setup. Press PAG to return to the measure pages

RELAYS or ALARM OUTPUT

·Page S17-Measure for Alarm 1
       Association of the output 1 with a measures for alarm controlling. Press the SET key to choose one the
       following measures The following list is available in 3PH-N mode.
       Some of the measures are not carried out in 1PH, 2PH and 3PH mode and therefore can not be found
       in the setup of the alarm.

V total ;	VL1;	VL2;	VL3
A total ;	AL1;	AL2;	AL3
kW total ;	kWL1;	kWL2;	kWL3
kVA total ;	kVAL1;	kVAL2;	kVAL3
kVAr total;	kVArL1;	kVArL2;	kVArL3
PF total ;PFL1;	PFL2;	PFL3	
THDV tot ;	THDV L1;	THDV L2;	THDV L3
THD A tot ;	THDA L1;	THDA L2;	THDA L3

       RLY   = relay 1 controlled remotely, via RS485, instead of locally as an alarm (go to S18)

Pressing the PAG key enables to go to one of the following pages:
set-up of the upper threshold of output 1 if one of the measures has been selected; (S19)
set-up of the relay output 2 if the remote mode has been selected for output 1 (S24)

·Page S18-Remote Rs485 relay 1 control
       if RLY is confirmed in S17 (see above) the position of the relay 1 is decided by the Rs485 master device
       (PC , PLC, etc) Press PAG to accept the RLY selection and enter the setup of relay 2 (go to S23)   Press
       SET to enable the alarm mode (go to S17).

·Page S19- Alarm 1 High threshold
Set-up of the upper threshold (H) of the selected measure. When the measure remain above the threshold   + hysteresis , for a time longer than the requested delay, the relay 1 is closed, range 000-999 (000-99.9 for the active, reactive and apparent powers) x 10^6.
Press the SEL key to select the digit or exponent to be modified.
Press the SET key to modify the selected digit or exponent.
Press the PAG key to go to the output 1 lower threshold set-up page.

·Page S20- Alarm 1 Low threshold
Set-up of the lower threshold (L) of the selected measure.
When the measure remain below the threshold hysteresis , for a time longer than the requested delay, the relay 1 is closed, range 000-999 (000-99.9 for the active, reactive and apparent powers) x 10^6.
Press the SEL key to select the digit or exponent to be modified.
Press the SET key to modify the selected digit or exponent.
Press the PAG key to go to the relay 1 hysteresis set-up page.

·Page S21 –Alarm 1 hysteresys
A value between 00 and 99 can be set in the 3 bottom digits, expressed as a % (percentage) of the alarm threshold.
The alarm condition is accepted only if the measure become higher than Threshold*(1+hysteresys%)
Pressing the SEL key enables to select the digit to modify.
Pressing the SET key enables to modify the selected digit.
E.g.: hysteresys = 02%
Pressing the PAG key enables to go to the relay 1 operation delay time set-up page.

·Page S22 Alarm 1 Delay
Relay 1 operation delay time set-up
A delay figure between 000 and 999 can be set in the 3 bottom digits, expressed in seconds.
The alarm will toggle only if the new alarm condition persist for a time longer than the delay
Press the SEL key enables to select the digit to modify.
Press the SET key enables to modify the selected digit.
Press the PAG key to go to set-up of the output 2

·Page S23 Measure for Alarm 2
Similar to S17 for relay 2.

·Page S24 Remote RS485 relay 2 control
Similar to S18 for relay 2.

·Page S25- Alarm 2 High threshold
Similar to S19 for relay 2.

·Page S26- Alarm 2 Low threshold
Similar to S20 for relay 2.

·Page S27 –Alarm 2 hysteresis
Similar to S21 for relay 2.

·Page S28 Alarm 2 Delay
Similar to S22 for relay 2.

8 – ADDITIONAL SETUP PAGES FOR MODEL STAR3 4-20mA
To access Programming Mode, open the front door and press the PAG and the SEL keys at the same time.
Use the SEL key to select a digit or a setting. Use the SET key to adjust it.
The setup can be protected with a password (see chapter 6)

·Page S10 4-20mA – Analogue output range
By pressing the SET key, the type of output (either 4-20mA or 0-20mA) can be selected.
Pressing the PAG key enables to go to the measure selection page corresponding to output 1.

·Page S11 4-20mA – Measure for output 1
Output 1 measure selection
By pressing the SET key one of the following measures can be selected for output 1:
V total   (3 PH, 2 PH or 1 PH according to the instrument set-up)
A total   (3 PH, 2 PH or 1 PH according to the instrument set-up)
Hz
kW total (3 PH, 2 PH or 1 PH according to the instrument set-up)
kVAr total   (3 PH, 2 PH or 1 PH according to the instrument set-up)
kVA total   (3 PH, 2 PH or 1 PH according to the instrument set-up)
PF   total   (3 PH, 2 PH or 1 PH according to the instrument set-up)
Pressing the PAG key enables to go to the measure selection page corresponding to output 2.

·Page S12 4-20mA – Measure for output 2
        Similar to the previous page for output 1
        Press PAG to go to the output 1 end value set-up page.

·Page S13 4-20mA Output 1 full scale value set-up
        Press the SEL key to select the exponent or the digit to modify.
        Press the SET key to modify the selected exponent or digit.
        Press the PAG key to go to the output 2 end value set-up page.

·Page S14 4-20mA - Output 2 full scale value set-up
        The programming procedure is the same as the output 1 full scale value.
        The PAG key enables to return to the measurement page.

9 - ELECTRICAL SPECIFICATIONS OF THE OPTIONAL OUTPUTS

SERIAL OUTPUT 485
Standard Rs485, max 32 instruments on each line without repeater, up to 247 instruments with repeaters
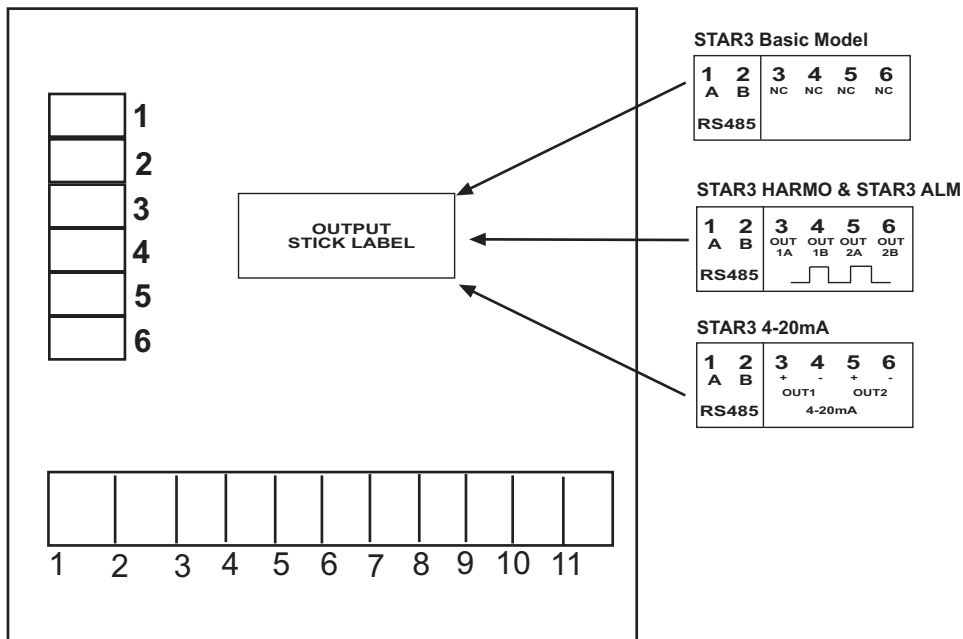
ANALOG OUTPUTS 4-20mA
 Max load impedance 500 (output conversion from 0-20 mA to 0-10 V with 500 output impedance)
The output signal accuracy is the same as the correlative measure   10 A.
 The output update time is 1 second.

RELAY OUTPUTS
Max load 250 VAC rms - 100mA rms

10 - TECHNICAL CHARACTERISTICS

Maximum dimensions (mm): instrument: 157,5 x 58 x 90
Power supply:
·   Until end 2004: 230Vac or 115 Vac +15%-20% @ 35÷400Hz (consumption 6VA)
·   From 2005 on: switching circuit.   90÷230 Vac or Vdc ±15% @ 0÷400 Hz (cons. 5VA)
Display: reverse red LCD with LED backlight
Voltmeter inputs: VL1, VL2, VL3, N up to 350V phase-neutral, 600V phase-to-phase, 35÷400 Hz
Voltmeter input impedance: 2 M
Voltage input overload: max 850 V phase-neutral
Current inputs: AL1, AL2, AL3, COM. Consumption 1 VA..3 or 2 external curr.transf 5A required.
Measuring range: 0-120% In
Sensitivity: current 20 mA ; voltage 10 V
Over current : withstand 50 amps for 1 sec.
Number of scales: 1 voltage scale, 2 current scales
Measurements: True R.M.S. up to25th harmonic = 1250Hz with fundamental @50 Hz
Sampling frequency: 2.5 kHz.
Accuracy: < 0.5% for Voltage and current and Power
Connection: Single phase or three phase star, three phase delta, or diphase systems
Weight : 0.6 Kg
Protection level: instrument IP20, front panel IP40
Temperature range: -10°C ÷ + 50°C
Relative humidity range: (R.H.): from 20% to 90%.
Condensation: non condensing
Relay output: V 250 max 120 mA A.C. max