



## User Manual

### DRS-45-1P-PLS DRS-45-1P-MOD

## DIN Rail Energy Meter for Direct Connected Single Phase Electrical Systems up to 45 Amps

### Warnings



Caution: Risk of  
Electric Shock

- During normal operation, voltages hazardous to life may be present at some of the terminals of this unit.
- At voltages below that specified in the Range of Use the meter may shut down. However, voltages hazardous to life may still be present at some of the terminals of this unit.
- Installation and servicing should be performed only by qualified, properly trained personnel abiding by local regulations.
- Ensure all supplies are de-energised before attempting connection or other procedures.
- Terminals should not be user accessible after installation and external installation provisions must be sufficient to prevent hazards under fault conditions.
- This unit is not intended to function as part of a system providing the sole means of fault protection - good engineering practice dictates that any critical function be protected by at least two independent and diverse means.
- The unit does not have internal fuses therefore external fuses must be used for protection and safety under fault conditions.
- Never open-circuit the secondary winding of an energized current transformer.
- This product should only be operated with the CT secondary connections earthed.
- If this equipment is used in a manner not specified by the manufacturer, protection provided by the equipment may be impaired.

### Warnings

Important Safety Information is contained in the Maintenance section. Familiarize yourself with this information before attempting installation or other procedures. Symbols used in this document:



Risk of Danger: These instructions contain important safety information. Read them before starting installation or servicing of the equipment.



Caution: Risk of Electric Shock

### 1 Introduction

The Multifunction Energy Meter, DRS-45-1P, is a new generation DIN rail mounted meter, used not only in the electricity transmission and power distribution system but also in power consumption measurement and analysis in high voltage intelligent power grid.

This document provides operating, maintenance and installation instructions for the DRS-45-1P. The unit measures and displays the characteristics of single phase two wire supplies including voltage, frequency, current, power, active and reactive energy, imported or exported. Energy is measured in kWh and kVAh. Maximum demand power can be measured over pre-set periods of up to 60 minutes.

The DRS-45-1P-MOD model features two built-in pulsed outputs and RS485 Modbus RTU comms. Configuration is modified through Modbus interrogation.

#### 1.1 Unit Characteristics

The DRS-45-1P-MOD can measure and display:

- Voltage
- Current
- Frequency
- Active & Reactive Power, Power Factor
- Imported, Exported & Total Active Energy
- Imported, Exported & Total Reactive Energy

#### DRS-45-1P-PLS

Has a single pulsed output to indicate Total active energy (kWh) measurement. The screen is fixed to Total Active energy.

#### DRS-45-1P-MOD

Has two pulsed output to indicate real-time energy measurement and an RS485 output to allow remote monitoring from another display or a computer.

#### 1.2 RS485 Serial – Modbus RTU

This uses an RS485 serial port with Modbus RTU protocol to provide a means of remotely monitoring and controlling the DRS-45-1P-MOD. Setup is possible using an USB to RS485 converter.

#### 1.3 Pulse output

DRS-45-1P-PLS has one pulse output and the constant is fixed to 1000imp/kWh.

DRS-45-1P-MOD has two pulse outputs. Pulse output 1 is configurable. Pulse output 1 can be set to generate pulses to represent:  
total kWh/ kVAh  
total import kWh/kVAh  
total export kWh/ kVAh.

The pulse constant can be set to generate 1 pulse per:  
1=1kWh/kVAh  
0.1 = 0.1 kWh/kVAh  
0.01 = 0.01 kWh/kVAh  
0.001 =0.001 kWh/kVAh (default)

Pulse widths: 200/100/60mS

Pulse output 2 is fixed to total kWh. The pulse constant is 1000imp/kWh.

Pulse widths: 60mS

### 2 Start Up Screens



Total active energy ( $\Sigma$  kWh). (Single screen on DRS-45-1P-PLS)



Imported active energy (kWh). (DRS-45-1P-MOD only)



Exported active energy (kWh). (DRS-45-1P-MOD only)



Voltage (V)



Current (A)



Instantaneous Active Power (W)



Frequency (Hz)



Power Factor (PF)



The first screen lights all display segments and can be used as a display check.



The second screen indicates the firmware installed in the unit and its build number.


Please note: The values may vary from the numbers shown here

\* After a short delay, the screen will display the total active energy measurement.


### 3 Buttons

The button operate as follows:

#### 3.1 Measurements


Each successive press of the  button selects a new parameter:

#### 4 Set Up

To enter set-up mode, press the  button for 5 seconds, until the "set" screen appears.



To enable 'write' function through modbus, the meter must be on 'set' mode.

To exit the set-up menu, press & hold  for 5 seconds until the "set" screen disappears.



This is the button used to rotate through the different parameter options. This is also the button used to cycle through numbers when in selection mode. Holding this button down will enable the "Set" mode for writing to the meter via Modbus.

## 5 Specifications

The DRS-45-1P can monitor and display the following parameters of a single phase supply:

### 5.1.1 Voltage and Current

- Phase to neutral voltage 176V – 276V AC L-N
- Continuous Overload voltage 120%
- Phase current to 45A (direct connected)
- Continuous Overload current 120%
- Burden <10VA (nom 2VA)
- Self powered

### 5.1.2 Power factor and Frequency and Max. Demand

- Frequency in Hz
- Instantaneous Power 0 to 999MW
- Reactive Power 0 to 999MVar
- Volt-amps 0 to 999 MVA
- Maximum demanded power since last Demand reset Power factor

### 5.1.3 Energy Measurements

- Imported active energy 0 to 99999.9 kWh
- Exported active energy 0 to 99999.9 kWh
- Imported reactive energy 0 to 99999.9 kVArh
- Exported reactive energy 0 to 99999.9 kVArh
- Total active energy 0 to 99999.9 kWh
- Total reactive energy 0 to 99999.9 kVArh

### 5.2 Accuracy

- Voltage 0-5% of range maximum
- Current 0-5% of nominal
- Frequency 0-2% of mid-frequency
- Power factor 1% of unity (0.01)
- Active power (W) ±1% of range maximum
- Reactive power (VAr) ±2% of range maximum
- Apparent power (VA) ±1% of range maximum
- Active energy (Wh) ±1% of range maximum
- Reactive energy (VArh) ±2% of range maximum
- Temperature co-efficient 0.013%/°C typical
- Response time to step input 1s, typical, to >99% of final reading, at 50 Hz.

### 5.3 Interfaces for External Monitoring

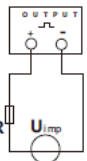
Three interfaces are provided:

- RS485 communication channel that can be programmed for Modbus RTU protocol
- Output indicating real-time measured energy. (configurable)
- Pulse output 1000imp/kWh. (not configurable)

The Modbus configuration (Baud rate etc.) and the pulse output assignments (kW/kVArh, import/export etc.) are configured through Modbus..

### 5.4.1 Pulse Output

The meter provides two pulse outputs. Both pulse outputs are passive type, which are fully isolated from the inside circuit. That generates pulses in proportion to the measured energy. The pulse outputs are polarity dependent, passive transistor output requiring an external voltage source for correct operation. For this external voltage source, the voltage shall be 5-27V DC, and the maximum input current shall be 27mA DC.



ATTENTION:Pulse output must be fed as shown in the wiring diagram below.Scrupulously respect polarities and the connection mode. Opto-coupler with potential-free SPST-NO Contact.

Contact range:5~27VDC Max.current Input:27mA DC

Pulse output 1 is configurable. The pulse output can be set to generate pulses to represent total / import/export kWh or kVArh. The pulse constant can be set to generate 1 pulse per: 0.001 (default) /0.01/0.1/1kWh/kVArh. Pulse width: 200/100/60ms Pulse output 2 is non-configurable. It is fixed to total kWh. The constant is 1000imp/kWh.

### 5.4.2 RS485 Output for Modbus RTU

The meter provides a RS485 port for remote communication. Modbus RTU is the protocol applied. For Modbus RTU, the following RS485 communication parameters can be configured from the set-up menu.

**Baud rate:** 1200, 2400, 4800, 9600 bps. Default: 2400

**Parity:** NONE/EVEN/ODD

**Stop bits:** 1 or 2

**Modbus Address:** 1 to 247 (default 1)

### 5.5 Reference Conditions of Influence Quantities

Influence Quantities are variables that affect measurement errors to a minor degree. Accuracy is verified under nominal value (within the specified tolerance) of these conditions.

- Ambient temperature 23°C ±1°C
- Input waveform 50 or 60Hz ±2%
- Input waveform Sinusoidal (distortion factor < 0.005)
- Magnetic field of external origin Terrestrial flux

### 5.6 Environment

- Operating temperature -25°C to +55°C\*
- Storage temperature -40°C to +70°C\*
- Relative humidity 0 to 95%,non-condensing
- Altitude Up to 2000m
- Warm up time 5 sec
- Vibration 10Hz to 50Hz, IEC 60068-2-6, 2g 30g in 3 planes
- Shock

\*Maximum operating and storage temperatures are in the context of typical daily and seasonal variation.

### 5.7 Mechanics

- DIN rail dimensions 18x118x64 (WxHxD) DIN 43880
- Mounting DIN rail 35mm
- Sealing IP51 indoor
- Material UL 94 V-0 Self-extinguishing

## 6 Installation and Maintenance

### 6.1 Installation notes

Units should be installed in a dry position, where the ambient temperature is reasonably stable and will not be outside the range -25 to +55°C. Vibration should be kept to a minimum. Preferably, mount the Integra so that the display contrast is not reduced by direct sunlight or other high intensity lighting.

### 6.2 Input Wiring and Fusing

Choose fuses of a type and with a breaking capacity appropriate to the supply and in accordance with local regulations.

A switch or circuit breaker allowing isolation of supplies to the unit must be provided where practical. In primary metering applications, ensure the supply is isolated before any

maintenance on the product. Tampering with the product seals may contravene local laws.

### 6.3 Wire Size

6mm<sup>2</sup> stranded cable is recommended for main power terminals. Choose cable type in accordance with local wiring regulations

### 6.4 Maintenance

The front of the case should be wiped with a dry cloth only, using minimal pressure. If necessary wipe the rear case with a dry cloth.

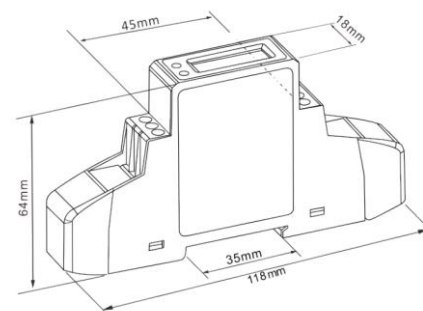
No user serviceable parts.

### 7 Declaration of Conformity

We, Tyco Electronics UK Ltd, declare under our sole responsibility as the manufacturer that the single phase multifunction electrical energy meter "DRS-45-1P", corresponds to the production model described in the EU-type examination certificate and to the requirements of the Directive 2014/32/EU EU type examination certificate number 0120/SGS0247. Identification number of the NB 0598.

### 8 Meter

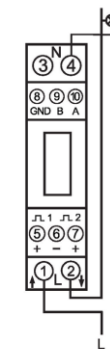
#### 8.1 Dimensions



#### 8.2 Appearance



### 8.3 Wiring Diagram (Both Models)



#### Explanation of Symbols



Refer to manual



Danger of electric shock



Do not discard

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