



# WESTKEN

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## **INTRODUCTION & BASIC EXPLANATION TO TIMER CONTROL SYSTEMS.**

So, you got a spotwelder or other type of resistance welder with a timer control system from *Westken* or you already have one of our wonderful machines and you are not sure how the timers system works, well hopefully you have read the section about spotwelding and resistance welding, so now, once again, lets try and explain in a way that everyone can understand without using to many big words, technical terms or baffling phrases.

Some simple explanations of words and terms can be found on our website [www.westken.co.za](http://www.westken.co.za). I will give an explanation on terms or words used with timers as we go through this exercise.

A more in-depth explanation of the welding processes and equipment will be covered in other sections on the *Westken* info page

### **CHAPTER ONE:**

- 1) So let have a look at what you got.
- 2) A simple explanation of clever words used concerning timers.
- 3) How the timer helps feed the beast air & power
- 4) What the welder timer does for you.

### **CHAPTER TWO:**

- 1) A bit more in-depth discussion of what happens with weld current control by the timer.
- 2) Setting stuff needed to make a resistance welder.
- 3) Comparing the old with the new.

**DIGIPAK 1**



**DIGIPAK 6**



**MASTER WELD 15**



## CHAPTER ONE:

### 1. SO LET HAVE A LOOK AT WHAT YOU GOT.

All spotwelder / resistance welding equipment needs to have some type of control, (a bit like being married,) besides controlling the welding time and power (heat/current) they can also control the air cylinder, various delays before and after welding to improve welding quality, manage welding characteristics and help take the responsibility for welding control from the operator and place this control into the machine. The basic systems, such as our **WK-DP-01 (Digipak 1)**, timers, as used on simple foot operated spotwelders control only time and heat. On older versions the timer system only controlled time, heat adjustment was by means of a tapping switch, much the same as a 160amp oil bath welder.

Slightly better versions of timer like the **WK-DP-04 (Digipak 4)** control can control the operation of the air cylinder, allow for one weld to take place, and allow for heat adjustment of this weld.

Then we get the good stuff like our **WK-DP-06 (Digipak 6)** that can control the air cylinder, allows for two welds to take place in the same program, can pulse the weld for welding horrible stuff like hot dip galvanized plate and have up to eight individually settable programs.

And finally, our top of the range timer controls the **WK-MW-15 (Masterweld 15)** has fifteen individually settable programs, has the ability to weld three adjustable times in the same weld program, can control the air pressure has the ability to hold the weld heat constant, does weld pulsing to ninety-nine pulses, upslopes, down slopes and looks really pretty in its white box.

Anyway, let me get back to where I was in discussing the timer control system.

### 2. A SIMPLE EXPLANATION OF CLEVER WORDS USED CONCERNING TIMERS.

There are lots of words that are used to explain functions and facilities used on a resistance welding timer control and/or spotwelders and their timers so let have a look at some of them. Please note this is a generalization of words and terms and not an in-depth study of what each word or term means. These explanations and descriptions are for guideline purposes only. Words in *highlighted* and in *italics* have descriptions in the section “*intro to words & terms*”.

**PLEASE NOTE:** It is important to note that all calculations for time or “time periods” used on our timers is based on the fact that electrical supply in South Africa is 50hz/sec therefore a time setting of 50cycles will be equivalent to 1 second, 100cycles is 2 seconds and 25cycles is a half second. This is standard with most timers systems through the world.

**Pre-squeeze time:** This is a delay time before the *Squeeze time* which can be used to extend the *squeeze time* when the machine is initially started. Most often used when the machine is in repeat mode to allow the machine to start a motor or use a highlights function on the first weld after which the *pre-squeeze* is bypassed and only the *squeeze* is used thereby shortening the up & down movement of the welding head.

**Squeeze Tim:** This is the delay time between the starting of the machine sequence by the foot or hand switch and the start of current passage through the weld area. This period allows the air cylinder on the welding head to operate “close” and achieve the required welding electrode pressure at the welding tips before welding current flows.

**Weld Time:** This is the actual time duration that the current is allowed to pass through the weld area.

**Weld heat / Weld current or Phase Heat:** It is the amount of weld current allowed to pass through the weld area. It is normally expressed as a percentage of the total available output of the machine.

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**Hold Time:** It is the period during which the weld is allowed to cool and solidify before the spot welder jaws are allowed to open.

**Off Time:** It is the time when the machine is not operating between welding sequences when the machine is being used in repeat mode.

**Repeat Time:** See off time.

**Cool Time:** It is the time between individual weld pulses when more than one weld pulse is required during a welding operation.

**Upslope:** Is the ability of the timer to ramp up (slowly increase) the heat for the first few cycles to allow as a pre heat of the weld area to stop weld spatter/sparks etc during the start of the weld. This function also helps clean the weld area just prior to welding taking place.

**Pulsation:** This function allows the timer to pulse the weld area with heat. Instead of one large lump of heat going into the weld area the timer uses less heat and sort of machine guns the weld area. This function works well with difficult materials that have coatings on them like zinc or galvanizing.

**Analogue Settings:** The settings based upon control by an analogue timer.

**Digital settings:** The settings based upon control by a digital timer that uses the zero crossing of the input power sine wave as a reference point.

**Weld on/off switch:** Most timer systems have a means to switch the weld off and still operate the machine during tip dressing and/or tip replacement.

**FRL (filter, regulator, lubricator):** this is a device that is attached to the machine to control the air pressure that is sent through to the cylinder. The pressure in the cylinder ends up at the tip face. This device also filters the air for impurities and lubricates the air that is passed to the cylinder.

**Thyristor:** This is the device that controls electrical supply to the transformer.

### **3. HOW THE TIMER HELPS FEED THE BEAST AIR & POWER:**

Alright! We have got our timer in front of us and want to use the machine.

First we will look at the *simple foot operated spot-welder*, the *Westken Econospot, Handispot or the 35/50kVA foot operated machines* all use a similar method of welding. These machines do not have an air cylinder to open and close the welding head. They rely on the operator to press down a foot switch that uses a mechanical lever system to open and close the welding tips. I will use the 50kVA *Westken Series 90 Footpedal* as a basis for my operation description.

#### **The Westken 50kva Series 90 Foot pedal welder with Digipak 1 (WK-DP-01)**

The 50kva **Series 90** foot pedal welder is fitted with the level **Digipak 1** timer control system. The timer is a membrane touch pad with an increment up (up arrow ^) and decrement down (minus sign -) for adjustment, a power on lamp, a start lamp, an AV lamp and a weld on/off lamp. This timer is *Westken's* basic digital programmable unit.

#### **Here is how it works.**

- 1) The operator places the part to be welded between the welding tips, he then presses down the foot pedal with his foot and the downward movement of the pedal raises a pushrod within the machine.

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This pushrod lifts the back end of the arm assembly and closes the tips. Once the tips touch pressure is built up between the tips due to a spring being fitted to the push rod. Once sufficient pressure has been achieved between the tips a micro switch fitted to the back of the arm assembly is triggered and the timer activated.

- 2) The timer has two settable functions the first function being **weld time** and the second function **weld heat** (power or current).
- 3) When the timer is activated it will allow electrical current to flow through the weld area for the preset time in cycles Hz (**weld time**) selected using the increment touch pad (up arrow ^) and paging through the menu on the screen on the face of the timer.
- 4) The **weld heat** (power or current) that has been selected using the **weld heat** selected using the increment touch pad (up arrow ^) and paging through the menu on the screen on the face of the timer. This is shown as a percentage of the total heat (power or current) available from the transformer, is allowed to flow through the weld area.
- 5) It is important to remember that a high heat setting used for a short time places less loading on the machine than a low heat for a longer time. Always try to keep the time as short as possible (10 – 20cycle) and use a higher heat setting.
- 6) Once the operator sees / feels that the machine has stopped welding he may then lift his foot from the foot pedal thereby opening the machine tips and the part can be re located for another weld or removed from the machine.

Now we can look at the air operated machines. These machines are the **50kVA Econospot**, **50kVA Series-90**, the **100/150kva Powerspot and Stronghold** type machines. The projection welders also operate using the same method. I will use the **70kVA Econospot** for my description using a **Masterweld 15 timer control system**.

**The Westken 70kVA Air Operated Econospot with Masterweld 15 Control**

The 70kVA **Econospot** is our base air unit. The machine is an air operated 70kVA spotwelder that can be fitted with the **Masterweld 15** as an optional extra. The **Masterweld 15** timer has the following functions available, pre-squeeze, squeeze, weld one, cool, weld two, hold, repeat, heat one, heat two, pulsation, upslope and weld on/off.

**Here is how it works.**

The operator places the part to be welded between the welding tips, the operator then places his foot into the electric safety switch and presses down the foot lever, and this action triggers a micro switch within the electric footswitch that activates the timer system. The timer then starts the following sequence of events.

- 1) **Squeeze time.** The timer first sends an electric signal to the **air solenoid valve**. This signal opens the **air solenoid valve** and allows air to travel to and enter the **air cylinder** which operates the opening and closing of the welding head. The welding head closes and brings the welding tips together. Once the welding tips are together the air continues into the cylinder until the air in the cylinder reaches the pressure that has been set on the **FRL (filter, regulator, lubricator)** unit. This part of the welding sequence is referred to as **Squeeze time.**
- 2) **Weld time.** Once the air in the cylinder has reached the required pressure, the tips closed on the job & the squeeze time has setting has run out then the timer will allow the welding operation to start.

Similarly to the valve controlling the air flow there is a type of valve that controls the electrical flow to the transformer inside the machine. This valve is called the **thyristor**. It is also known as the **S.C.R or AC switch**. For this exercise we will refer to it as the thyristor.

The timer now “opens” the *thyristor* valve and allows electricity to flow to the transformer. The electricity enters the *transformer* on the *primary* side, or incoming side of the transformer, the incoming electricity passes through the primary winding where it passes over to the *secondary* side of the transformer and is changed from high voltage / low amperage to low voltage / high amperage. The electricity is changed or transformed to a different type of electricity hence the word “transformer”.

From the transformer the electricity (welding current) passes through the machine arms, onto the welding tips and then through the part to be welded. Due to virtually all the materials being used in the transformer primary side and the secondary side being copper or brass (these materials allow electrical current to pass easily) the area of most resistance to electricity flow is at the part being welded. This part now gets hot and starts to melt causing a weld.

### 3) weld heat (phase heat/weld current)

In the old days transformer output was controlled by a series of tapping that basically increased or reduced the amount of primary turns or windings that fed electricity into the transformer and thereby increased or reduced the amount of welding heat or current being available to weld with, but we are clever now. If you remember what we said above about the thyristor being a sort of valve for electricity, well it didn't take long before somebody realized that, as with any valve, it could be opened partially or fully to allow partial or full flow of electricity into the transformer. The weld heat/phase heat/weld current setting on the timer controls the amount of heat allowed into the weld area. If you look at the timer system it will give outputs in percentages ie 70% heat. What this means is that 70% of the total available output of the transformer in that specific machine will be allowed to pass into the weld area. I will explain how this system works further on.

### 4) hold time.

Now we have just sent all this *welding heat/current* into the weld area and we have these two pieces of steel plate that have melted at the point of contact between the copper welding tips. If we just open the machine the parts will fall apart as the weld has not dried and stuck the parts together. The *hold time* is a short time delay to allow the weld pool to dry and solidify before the tips open. If you can imagine two bits of wood being glued together. Glue is placed between the two bits of wood then they are clamped together until the glue dries, only then is the clamp removed. This is what the *hold time* does; it holds the parts together until the weld pool (glue) is dry.

### 5) repeat/off time.

OK. So now we have a completed and dry weld, we can either stop welding or carry on with the next weld. If we stop welding the operator takes his foot off the electric foot switch and the machine stops. Should we wish to carry on welding we can either take our foot of the electric foot switch after each weld then put it back on again to restart the welding process or we can use the *repeat/off time* setting on the timer system. The *repeat/off time* function operates much like a sewing machine. It allows the machine to repeat the welding sequence again and again while the operator holds the electric foot switch down until the operator finally takes his foot off the electric switch thereby stopping the machine. The setting on the timer is a sort of delay function between the stopping and starting of the machine. The longer the delay period in cycles the longer the machine takes to open and close the copper welding tips. The shorter the delay period the quicker the tips open and close. If the *repeat/off time* is set too short the tips will not open and close but the machine will keep placing welds in the same spot.

The above explains a simple *four stage welding* process ie. *Squeeze, Weld, Hold, Off* with *heat/current* adjustment. The timer controls have the ability to offer a *six stage welding* process *Squeeze, Weld, Cool, Weld, Off* where we introduce a second weld and heat setting. The *Cool Time* is a delay period between the two welds.

#### **4. WHAT THE WELDER TIMER DOES FOR YOU.**

Essentially the timer system controls all functions needed to make a successful weld. The more basic timer systems ie “*Digipak 1*” setup for foot pedal welder control only *weld time* and *weld heat/current* but top of the range timers “*Masterweld 15*” can control air pressure and change the air pressure during welding, they control welding heat/current, watch water flow and all this while still managing the four basic functions of squeeze, weld, hold and off time. These types of timers are capable of operating pedestal welders, projection welders, butt & flash butt welder and seam welding machines. With the ability to install software that is user specific we can introduce functions over and above those normally associated with resistance welding such as motor start function, PLC communication and outputs to indicate when tips need to be dressed and/or changed.

### **CHAPTER TWO**

#### **1. A BIT MORE IN-DEPTH DISCUSSION OF WHAT HAPPENS WITH WELD CURRENT CONTROL BY THE TIMER**

All the standard AC resistance type digital welding controls are just glorified counting and switching devices. They look at the electricity coming into the machine, watch for the AC wave and using this wave, count the times the wave changes from the positive side of the wave to the negative side of the wave.

The point at which the wave crosses over from the positive side to the negative side is called the Zero crossing. This is the point from which all counting is undertaken. There are 50 such cycles in a second where the wave starts at the zero crossing moves through the positive side of the wave then crosses back through the Zero crossing point then becomes negative and then cross back to the Zero crossing. Half the time the wave is positive and half the time the wave is negative. This is call a full cycle.

All timing functions undertaken by the timing system whether they are for the squeeze, weld, hold or off/repeat time are based on these cycles.

The control of the welding heat/current also uses the AC wave form to control the amount of welding heat/current allowed into the weld area.

What happens here is that the *Thyristor* (our electrical valve) is simply opened or switched to allow a full wave to pass through it to the *transformer* when we want 100% of our transformer output in the weld area. Should we want only 50% of the output of the transformer then the thyristor is opened or switched to allow 50% of the wave to pass through it, this allows the transformer to deliver only 50% of its available *welding heat/current* into the weld area.

#### **2. SETTING STUFF NEEDED TO MAKE A RESISTANCE WELDER.**

So let’s have a brief look at what we have got and what we need to make this weld happen.

With a *foot machine*, say the *Westken Handispot 25kVA*, we need a means to open and close the welding tips (*foot pedal*). Some way of getting pressure on the welding tips (*spring on the upright push rod*), a start switch (*micro switch fitted to the upper/moving arm*), a transformer (*25kVA water cooled transformer*) & a means to switch the transformer on and off (*thyristor*), a timer system (*Digipak 1*), some way of getting the weld heat/current to the tips (*upper and lower brass arms and upper flexible laminated shunt*) and a frame to put all this stuff into (*handispot frame assy*). Additional to the above we will obviously need electricity to run the machine and water to cool the tips, transformer and firing device. As discussed above in “*The 25kVA Handispot with Digipak 1*”, “the operator presses down the foot pedal and all the events to create the weld begin.

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With an *Air machine*, say the *Econospot 50kVA*, we need a means to open and close the welding tips (*air solenoid valve*). Some way of getting pressure on the welding tips (*air cylinder*), a start switch (*electric foot switch*), a transformer (*50kva water cooled transformer*) & a means to switch the transformer on and off (*thyristor*), a timer system (*Masterweld 15*), some way of getting the weld heat/current to the tips (*upper and lower brass arms and upper flexible laminated shunt*) and a frame to put all this stuff into (*Econospot frame assy*). Additional to the above we will obviously need electricity to run the machine and water to cool the tips, transformer and firing device. As discussed above in "*The 50kva Econospot with Masterweld 15 control*" "the operator presses down the electric foot switch and all the events to create the weld begin.

**Conclusion.** The above is a simple and brief introduction on what a timer system is and how it works in your machine. It is not meant to be an in-depth study of resistance welding control. I hope this is of help to those new to this method of welding and can help those who already use this equipment to have a better understanding of what equipment they have and how this equipment works.

3. **COMPARING THE OLD WITH THE NEW.**

The following is a quick reference to how the Timers systems was upgraded and replaced through the years at Westken:

**WK-DP-01 (Digipak 1)**, (Replaces Westken *TIAP1*)

**WK-DP-04 (Digipak 4)** (Replaces Weldpak WK-MPS-08 & *MINIPAK WK-MPS-01*)

**WK-DP-06 (Digipack 6)** (Replaces Datapak Series 1&2 & *T1AP\$-03*)

**WK-MW-15 (Masterweld 15)** Replaces the Smartpak & WK-MPS-08

**And finally,**

This is another in a set of documents that hopefully will help you understand the equipment better. There will be a more in-depth study of the timer, air system, cooling system and how and why a weld takes place.

Look on our website [www.westken.co.za](http://www.westken.co.za) for the following:

- 1) Introduction to set-up of Westken spotwelding timers for newcomers & others.
- 2) Cooling water for welding machines.
- 3) Explanation of clever words & terms concerning Resistance welding & timer systems.
- 4) Introduction to Spotwelding for newcomers and others.
- 5) Introduction & a basic explanation to Timer control systems.
- 6) Manuals for other machines in our range of equipment.

If you have any questions concerning the above or others question concerning resistance welding, please do not hesitate to contact one of our really clever people at **Westken**. Try the following people who might be able to give a helping hand or some good advice. Remember they do it almost every day, I am talking resistance welding.

**Really technical stuff** concerning the mechanical and electrical layout and workings of the machines:  
..... Mr. Stuart Dorling. [tech@westken.co.za](mailto:tech@westken.co.za)

**Stuff concerned with machining** the copper, brass, soldered type electrodes etc and the setup manufacturing or usage of machinery.  
..... Mr. Jaco Truter. [info@westken.co.za](mailto:info@westken.co.za)

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**When you can get stuff** and how much stuff costs  
..... Ms. Laroshelle Pryor

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*If you are not sure, please phone and ask, we will help.*

If you are experiencing weld nut, resistance or stud welding problems or enquiries please do not hesitate to contact us on  
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