

# P40 AGILE RETROFIT SOLUTIONS



## Refurbishment of legacy K-relays by P40 Agile feeder management IEDs P14N, P14D, P94V

The footprints of both the device physical size and the lifecycle environmental impact have been minimised using state-of-the-art design, component and process selection. Agile solutions from Grid Solutions are ideal for new-build and retrofit alike.

### Customer Benefits

- **Shorter preparation time - no application checks needed, setting conversion tool**  
All electrical burdens of P40 Agile are lower than those of K-relays. Consequently, application checks are not required to confirm the usage of P40 Agile with respect to available substation battery, current and voltage transformers, and existing control cabling. The setting file from the existing K-relay can easily be converted to the target P40 Agile IED settings through a dedicated tool available in S1 Agile (see Figure 2). The converted setting file can then be simply downloaded to the P40 Agile IED.
- **Shorter outage time - typically less than ten minutes**  
P40 Agile IEDs can be secondary tested on the bench with the application settings downloaded, as part of the preparations for refurbishment. Then, the K-relay needs to be simply drawn out from the case, with the P40 Agile being plugged in thereafter (see Figure 3). If needed as per the selected process, a trip test can be done, followed by full service restoration as the existing wiring is not disturbed.
- **Lower refurbishment cost**  
Given that the preparation times are shorter, also noting that the drawing modifications will be minimal, and with the actual site work being in the range of a few minutes, the overall cost for this refurbishment will be significantly optimised. The key benefit lies in maximum availability of the substation with reduced down time.

P40 Agile extends the life of your switchgear installed base, offering a safe and simple mid-life upgrade.

### Customer Benefits

- Shorter preparation time
- Shorter outage time - few minutes
- Lower refurbishment cost
- Lower operational cost - fewer spares holdings
- Future-proof



Figure 1. Shorter outage time - typically less than ten minutes



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## Lower Operational Cost

### Fewer spares needed

P40 Agile offers universal 1 A/5 A CT inputs (software selectable) across a single pair of terminals per input, as opposed to other vendor solutions where the ordering information should specify 1 A or 5 A, or worse still have 3 or 4 terminals per input thus losing pin-to-pin refurbishment capability. P40 Agile also offers an AC or DC universal wide-range power supply across two terminals. This allows harmonisation at one ordering option and means that P40 Agile spares holdings can be lower than for K-relays.

### No training needed

For personnel already familiar with modular MiCOM Px40 IEDs, there is no training needed to engage with P40 Agile. This is made possible thanks to the meticulous retention of the family identity in P40 Agile, including the IED ordering 'CORTEC' codes, the menu structure, the S1 Agile tool suite, PSL programmable logic, Digital Data Bus (DDB) numbers, communication protocols, and protocol register / database reference numbers. Notably, the high performance protection algorithms have a strong service track-record.

### Continuity in support

Your Grid Solutions local teams which provide support for K-relays are also on-hand to assist with P40 Agile. Continuity of application support throughout the migration ensures a smooth transfer at all steps. This is particularly important in a strategic asset life extension exercise, where often only the secondary equipment is upgraded, keeping the work on primary plant to an absolute minimum, including reuse of the existing relay cases. P40 Agile offers pin-to-pin mating with the existing case, to eliminate any on-site surprises.

## Future Proof

### NERC-compliant cyber security ready

When opting to connect P40 Agile to wider networks, there could be associated security concerns. To secure communication within such environments, P40 Agile offers NERC-compliant cyber security, thereby pre-empting future corporate policy movements into this area.

### Environmentally responsible

P40 Agile IEDs are manufactured in a lead-free soldering process and use lead-free components. Power dissipation and product weight (including packaging) have been optimised to reduce the carbon footprint. The Product Environment Profile (PEP) document demonstrates Grid Solutions' Corporate Social Responsibility (CSR) and also enhances the CSR index of the end user utilities.

## Site Work Optimisation

Site work is naturally kept to a minimum because of the extent of compatibility, as depicted on the next page. In order to further optimise the time taken to prepare for the site work, the S1 Agile tool suite offers automatic setting file conversion (see Figure 2).

## Distribution Automation and IEC 61850 Ready

In non-automated distribution substations, either during refurbishment or as the next step, a multi-function substation server can be added, linking the P40 Agile IEDs on a serial communications bus.

This combination then provides many options for substation automation, and can act as a secure gateway to remote HMI clients, thereby facilitating remote distribution management.

## Refurbishment with Higher Functionality

When K-relays are refurbished with P40 Agile, it can be an opportune time to add functionality. In some instances, minor rewiring can be done, if for example, additional binary I/O is activated. At the same time, minor re-wiring may be needed in voltage circuits, if indicated in the P40 Agile equivalent table on Page 4. This rewiring is a low-risk activity, as it does not affect the CT circuits.

## PX20, K-Series to Agile Settings Conversion Tool

### Setting file conversion ready

The setting file from the existing K-relay and MiCOM Px20 can be converted to the target P40 Agile IED's settings with ease. The converted setting file can then be simply downloaded to the P40 Agile IED.

After conversion, merely a quick glance is sufficient to validate the setting file, a thorough setting / co-ordination exercise is not needed, due to the automated process, which eradicates any possible manual error. This just leaves the programmable scheme logic (PSL) file to be created, which typically is done just once, as the PSL is often copycat re-used in all feeders in a given substation.

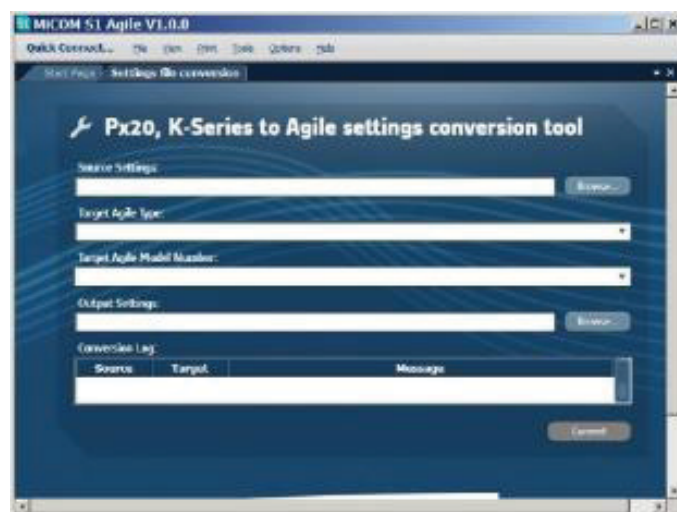


Figure 2. Automatic relay setting conversion tool



Typical relay panel with KCEG and KCGG Relays



P40 Agile loaded with settings



Withdraw the KCEG relay



Replace with Agile P14D relay



Withdraw the KCGG relay



KCGG relay being taken out



Replace with Agile P14N relay



Old relays are replaced

**Energise**

**Less than 10 Minutes**

Retrofit done in less than 10 minutes  
Minimum outage time

Figure 3. Shorter outage time - typically less than 10 minutes

## P40 Agile is the Best Choice to Refurbish K-Relays

In addition to new-build, P40 Agile IEDs can be used to refurbish legacy protection schemes. Most P40 Agile models (see Figure 4) share the same pin-outs of equivalent K-relays, and are housed in the same case sizes. Users can choose to draw-out existing K-relays and plug-in equivalent and suitably configured P40 Agile models, with no change to the existing as-fitted field wiring. This draw-out-and-substitute (DOS) strategy dramatically reduces the refurbishment time and cost.

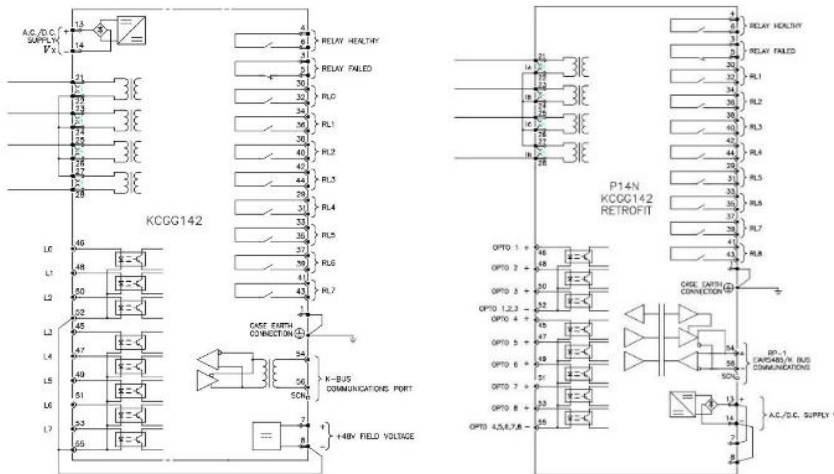


Figure 4. Pin-to-pin equivalence of K-Series and P40 Agile

P40 Agile has been designed in such a way that when plugged into the existing case, it fits to perfection being an exact size match. The IP protection is maintained and there is a snug fit so as not to project outwards from the panel, such that the refurbishment looks as professional as a new-build. Accordingly, there is no need for any physical cover or physical wrapper addition. There is no need to relook into the operational procedures of the substation, effectively making this DOS option a fit-and-forget solution.

As seen in Figure 4, there are minor differences between the two wiring diagrams. The numbering convention followed for binary inputs and output relays in P40 Agile is different from that of K-relays; this, however, does not affect pin-to-pin terminal compatibility. The other difference is the field voltage (terminals 7, 8). The field voltage was a legacy from earlier relay designs, which provided fixed 48V, non-universal, binary inputs. The P40 Agile inputs are universal and can withstand any surge or capacitive discharge without the use of resistors external to the relay. Consequently, the field voltage is not available in P40 Agile, on the grounds that it is not really needed any more. For the purpose of K-relay refurbishment, however, there is an internal wiring loop option (terminals 13, 14 to terminals 7, 8 respectively) that can be optionally ordered to mimic the field voltage. This option can be chosen by putting a .2. for the tenth character in the ordering CORTEC code of P40 Agile IEDs.

## The P40 Agile Equivalent

| K-SERIES   | P40 AGILE     |
|------------|---------------|
| KCGG110    | P14NB         |
| KCGG120    | P14NB         |
| KCGG122    | P14NB         |
| KCGG130    | P14NB         |
| KCGG140    | P14NB         |
| KCGG141    | P14NB         |
| KCGG142    | P14NB         |
| KCGG142-02 | P14NB         |
| KCGU110    | P14NZ         |
| KCGU140    | P14NZ         |
| KCEG130    | P14DB         |
| KCEG140    | P14DB         |
| KCEG142    | P14DB         |
| KCEG150    | P14DB*        |
| KCEG152    | P14DB*        |
| KCEU140    | P14DZ         |
| KCEU141    | P14DZ         |
| KCEU142    | P14DZ         |
| KCEU150    | P14DZ*        |
| KAVR100    | P94VR***      |
| KAVS100    | P94VP***      |
| KVFG122    | P94VB***      |
| KVFG142    | P94VB***      |
| KVTL100    | P94VB/P14NB** |
| KVTL101    | P94VB/P14NB** |
| KVTR100    | P94VR/P14NB** |
| KVTR102    | P94VR/P14NB** |

\* Residual voltage 19, 20 to be wired to 15, 16, in P14D

\*\* Field voltage 13,14 to be looped to 7, 8 in P94V

\*\*\* Contact GE Vernova for information regarding synch, field, residual or single phase voltages, as applicable

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