Scandinavian Road Traffic Signal Conference

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Experience with low voltage installations in Norway

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What regulations and standards are used for today's road traffic signal systems in Norway?

- FEL- Regulations concerning electrical low-voltage installations
  - Performance-oriented and has no solutions for installation
- NEK 400 Electrical low-voltage installations (The Norwegian Electrotechnical Committee) 2010
  - Has suggestions for solutions as to how to comply with FEL requirements
  - It is up to the Contractor and the Project Owner to find solutions and assess risk

Which sections are important?

FEL Chapter V Safety requirements

- **Section 20** protection against electrical shock during normal use
- **Section 21** protection against electrical shock in case of faults

Which sections in the standard are important?

- NEK 400-4-41 Protection against electrical shock
  - 413 protection by means of electrical separation
    - An isolating transformer (230/42 volt) is used in the controller
    - Safety transformer in accordance with NEK EN 61558-2-4
  - 414 protection in the case of extra low voltage SELV and PELV
    - Voltage equivalent to 42 volts is used in voltage band 1 from the isolating transformer.

Controller cabinet

Equalizing earthed connectors

- Interconnectors (earthed) are used on the 42 volt side of the transformer to safeguard against shock hazards in the case of faults in other electrical installations near signal system installation areas.
- All signal head posts in the system are connected with interconnectors.

Road traffic signal light posts and light pole close together.

The Low Voltage Directive

- Directive 2006/95/EU (the Low Voltage Directive) has something to say about voltage limits – these are different in Norway and in the EU.
- Norway
  - AC 0-1000 volts
  - DC 0-1500 volts
- EU
  - AC 50-1000 volts
  - DC 75-1500 volts

Meeting FEL requirements

Basic protection and protection against faults

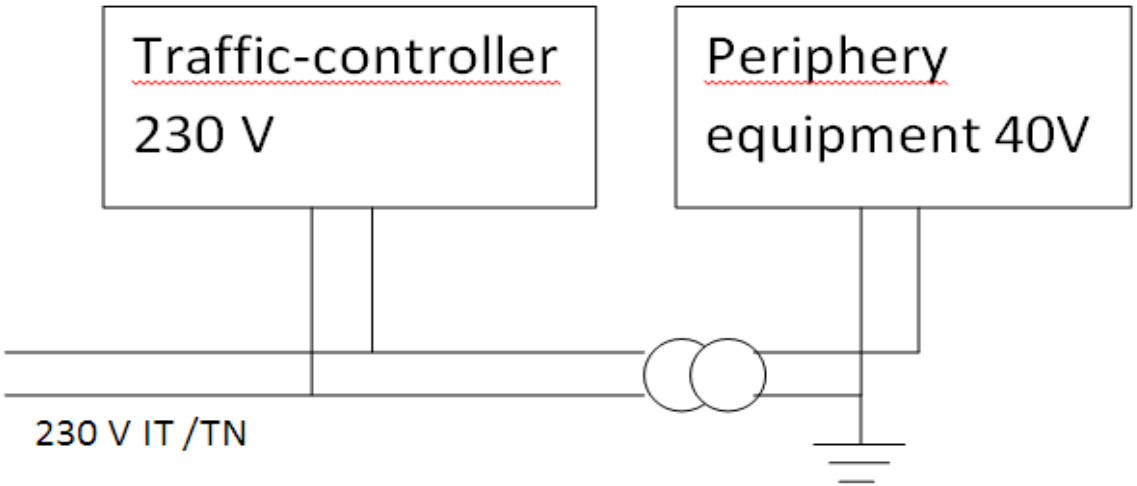
- The voltage in voltage band 1 is under 50 volts
- There is complete separation between 230 volt and 42 volt by means of a safety transformer
- Interconnectors (earthed) have been chosen for use between all road traffic signal light posts and controllers

Background for choice of 40 V installation

- Introduction of installation with higher electrical safety against electrical shock for personnel
- Stabilization of power supply by use of transformer
- Standardization of LED (OCIT standard)
- Reduced energy consumption on LED

- Proxll have installed and maintains about 40 installations based on 40 V technology from Siemens in the Oslo area

Schematic diagram for 40V installations



Periphery equipment 40 V



Improved electrical safety

- In low voltage installation is 40 V max exposure voltage
- Periphery equipment may be exposed for damage because of snow removal, accidents or vandalism
- Live parts can be exposed due to these damages

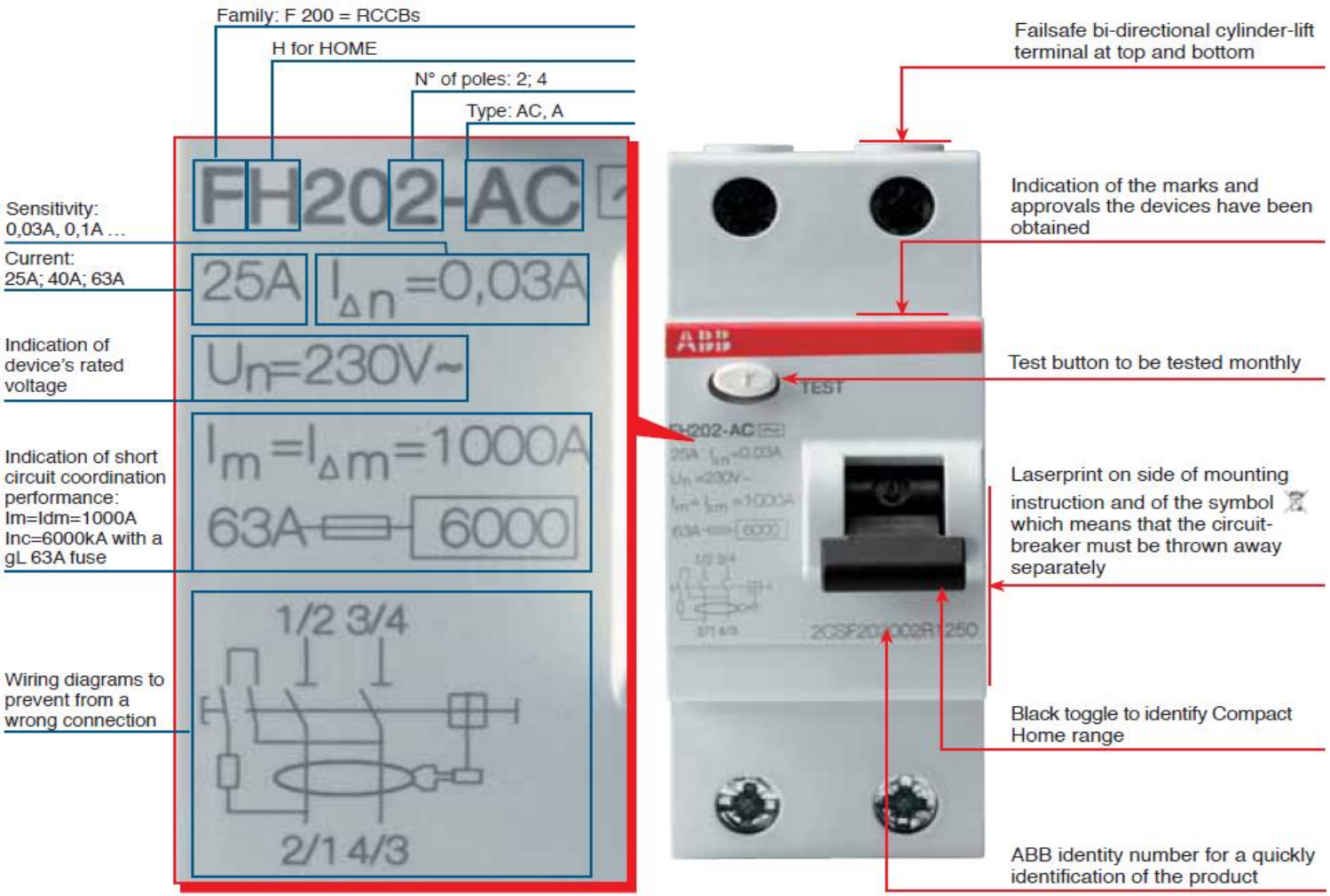
Improved electrical safety

- Personnel can be exposed to voltages were live parts are exposed (also for service personnel)
- The RCD (earth fault disconnector) will be the only barrier for prevention of electrical shock in a 230 V installation
- In the manual for the RCD is compulsory to test the device monthly by use of the test button

Who can confirm that this procedure is followed?

40 V installations will give improved electrical safety

Improved electrical safety



Krav fra produsent

Test månedlig av jordfeilbryter!!!!

Stabilization of power supply

- The 230 / 40 V transformer will be an efficient filter for voltage ripple on the primary
- This will give less possibilities for ripples causing problems for signaling and lamp currents on the secondary side of transformer
- Our experience is that this is not the case

- The problem is that the weak secondary side easily pick up induced voltages and currents in the secondary side cable installation
- We look on the possibility of introducing a filter on the secondary side

40 V installation have until now not given improved stability due to more stabilized voltage on the secondary side

Standardization of LED

- 40 V technology has standardization of Led units
- The OCIT standard secure that all LED which comply can be installed in the installation

- In 230 V installation there are no standard for LED units. We have experienced that when new LED units or controller are installed , testing must be done in order to check that controller and LED work satisfactory together
- Because of this, it may be necessary to replace more parts in the installation in case new controller or LED are introduced in the installation

Standardization of LED in 40 V result in more predictable service and maintenance. The fault rate seems to be lower

Reduced energy consumption

- 40 V LED units consume less energy?

- 40 V LED consume 5-8 W
- 230 V LED consume 7-14 W

40 V LED have slightly lower power consumption

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Summary

- 40 V technology give higher electrical safety against electrical shock for personnel
- We have not yet experienced better stabilization of power supply by use of transformer
- Standardization of LED (OCIT standard) give more predictical service and maintenance
- 40 V LED give slightly reduced energy consumption
- The installation cost is similar for 40V and 230V technology
- We see increased life time for 40 V LED units

40V technology have a clear advantages compared to 230V technology

Finally

- Thank you for your attention