Basic characteristics
The ARL 4 V 2.0 Automatic Tuning Device for Arc Suppression Coils is determined for automatic regulation of a moving part of the Arc Suppression Coil connected in the neutral point of a distribution transformer in compensated MV networks (setting of inductance L).

Variable inductance of the Arc Suppression Coil (ASC) together with capacity of MV network creates a parallel resonance circuit. In a tuned state of the circuit (maximum voltage U0 of the transformer neutral point) the total capacity current Ic is compensated by just set current of the ASC IL. When an one-phase earth fault occurs in the tuned state only minimum active current flows through the fault place.

Resistor Controller provides switching of the power resistor parallel to the ASC in the event of one-phase earth fault in compensated MV networks for temporary increase in the active component of fault current and therefore an improvement of conditions for action of electronic protections and indicators that are decisive for earth fault localization.

Technical specification
The ARL 4 V 2.0 Automatic Tuning Device is a programmable microcomputer device, the HW and SW of which provide required features, basic functional features and technical parameters:

**Automatic Tuning Device of ASC (AL)**
- automatic start of tuning process with high sensitivity of U0 change only in the event of MV network configuration change
- high resistance to possible redundant starts of tuning process at changes of operation states, faults and U0 changes that meet start conditions but they are not in direct connection with the MV network configuration change (U0 floating, harmonic signals, contributions of remote faults etc.)
- automatic compensation of U0 spontaneous changes
- high reliability of localization of the U0 resonance maximum
- automatic setting of the final operation state of under tuning or over tuning in connection with the selected percentage value from the ASC resonance circuit
- local and remote blocking of functions or start of the tuning process
- local and remote signalling of states and failures
- local manual and remote control of the ASC operation (to the required value of IL)
- high accuracy of the U0 voltage measurement within a wide dynamic range of 0 - 120 V, 0 - 120 % UN, registered resolution ability of 2 mV
- registration and summarization of fault states from the ASC protection devices
- in the event of an unreliable localization of resonance maximum of stopping of the tuning process, temporary error code, setting of the ASC L to the required value (parameterization) and after passing of the selected time delay a new start of the tuning process
- automatic calibration for voltage scanned from the ASC potentiometer (ASC position)
- integration of transient conditions (parameterization) for resistor switching at transient earth faults
- parameterization possibility of resistor cyclic switching at fulfilment of conditions until run-out of thermal capacity
- resistor local and remote switching and blocking of automatic functions

**Resistor Controller (RC)**
- control of resistor switching
- maximum use of output (thermal) capacity of the resistor:
  - modelling of the thermal image
  - direct temperature measurement by means of a pyrometer

ARL 4 V 2.0 AUTOMATIC TUNING DEVICE FOR ARC SUPPRESSION COILS
The ARL 4 V 2.0 Automatic Tuning Device is a combined automatic device intended for tuning of Arc Suppression Coils and automatic Resistor Controller switching.

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**Fig.: Block Diagram**
Common function for the ARL combined automatic device

- local and remote parameterization of functions
- connection to the local control system through galvanically separated serial interface:
  - standard protocols (e.g. IEC 870 and derived ABB, Landis & Staea, Siemens, AEG)
  - non-standard protocols
- communication serial interfaces:
  - optical
  - variant RS 232, RS 485
- local control and visualization (membrane keyboard, LCD display),
  graphic - intelligent display with an integrated tactile keyboard
- SW for PC notebook for parameterization and reading of records at automatic activity of ARL, visualization, statistics, archive
- self-diagnostics, protection against ineligible functions in fault case of automatics elements, fault signalling

Technical parameters

Binary inputs
- galvanic separation
- insulation: 4 kV
- consumption: type 2.5 mA, max. 4 mA
- level log 1: 24, 110, 220 V DC
- level log 0: 30 % of log 1

Binary outputs
- galvanically separated relay contact
- insulation: 4 kV
- switching ability: 1000 W/VA
- tripping ability: 30 W/VA

Analog input U₀
- galvanic separation by a measuring transformer
- insulation: 2 kV
- Un: 100 V
- overload capacity: 1.2 Un
- dynamic range of measurement: 0 – 64 V
- consumption max.: 0.1 VA

Analog input Uₚ - potentiometer voltage
- galvanic separation by the measuring transformer
- insulation: 2 kV
- range: 0 – 5 V, 0 – 20 V
- consumption max.: 0.1 VA

Analog output Uₚ - for potentiometer supply
- galvanic separation by the measuring transformer
- insulation: 2 kV
- output voltage: 5 V/50 Hz

Auxiliary supply
- the source is galvanically separated with an insulation 4 kV
- consumption: < 10 W
- Un: 24, 110, 220 V DC

Constructional layout
- enclosure RITTAL, 1/2 19"
- degree of protection: IP 20

Ambient temperature ranges
- working: -15°C to +55°C
- storage, transportation: -25°C to +70°C

Parameters limiting the ASC tuning

- minimum voltage U₀ for start of the tuning process: 50 mV
- minimum change of measured voltage for start of the tuning process: 3 % measured voltage U₀
- maximum over tuning (under tuning): 0 – 25 % of the ASC current
- maximum speed of measured voltage change: 25 V/s
- minimum ratio U₀max/U₀min for tuning: 1.05

Fig.: ARL4 Mechanical layout