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Dear User!

We, at Procon Ltd. express our thanks for your decision to buy the frequency converter developed and manufactured by our company. We are proud of being in the position to serve you with a state of the art equipment of excellent quality. We believe, its use will justify your decision and by its technical parameters your new equipment will be a useful and reliable tool in solving even the most sophisticated tasks in the field of electric drives. This manual gives a description of the converter's technical parameters and its upgrading possibilities. For the right functioning of the converter please read through this manual carefully, even if you have already used Procon made frequency converters. We would be pleased to receive your remarks and suggestions referring to this manual or the frequency converter.

INTRODUCTION

This manual describes the features and parameters of the frequency converters of types ISD, ILD and IHD.

Features of the equipment :

- 3 x 400V line operation (at request 1 x 230V),
- Built-in line interference suppressor according to the Hungarian standard MSZ EN 55011 B1,
- Wide range of power ratings (0.55kW-200kW),
- Protection against terminal short circuit,
- Protection against body contact,
- Protection against overload,
- Protection against overvoltage,
- Protection against overheating,
- Protection against motor flip-over,
- Electronic thermal protection of the motor upon the preset motor parameters,
- Double potential separation of each input and output,
- Programmer devices according to request:
     built-in or remote quick programmer,
     built-in or remote terminal,
- Backlight displays according to request:
     built-in or remote 2 x 16 character LCD,
     built-in or remote 4 x 16 character LCD,
- Reception of incremental rotation speed encoder (IRE),
- 2x RS485 serial lines,
- 5x Free programmable digital inputs,
- 8x Digital outputs,
- 8x Inputs for program activation,
- 3x Free programmable relay outputs,
- 2x Free programmable analogue inputs,
- 2x Free programmable analogue outputs,
- Built-in calendar and clock,
- Optional built-in dynamic brake,
- Switched cooling fan,
- At request IP 54 casing, etc.

Programming:

- User friendly programming,
- Multilingual menu system,
- Parameter setting during operation,
- Flexible programmability:
     from terminal, quick programmer and computer,
- Parameter charts to be saved:
     in the equipment, terminal and computer,
- Error logging with date and time,
- Wide output (motor) frequency range (0-1000Hz),
- Adjustable switching frequency (2-16 kHz),
- Control and regulation mode available,
- 4 different built-in PID algorithms,
- PLC functions,
- Master / slave connections,
- Rotation speed regulation,
- Position regulation,
- Running of even 8 independent programs,
- Motor frequencies can be inhibited,
- Slip compensation,
- Flying start,
- Acceleration times and deceleration times with breakpoints,
- 4 different pre-programmed U/f characteristics,
- Editable U/f characteristics (6 breakpoints),
- "S" curve function for acceleration and deceleration,
- Optional dc breaking,
- 4 different user parameter sets,
- Editable quick menu,
- Selectable programming or operating status display,
- Editable display symbols (value, dimension),
- Timing functions,
- Time programs to be locked to the calendar,
- Automatic error acknowledgment,
- Remote controlled mode,
- Windows based computer operating program etc.

- **PURPOSE OF THE EQUIPMENT:**

The ISD, ILD and IHD series frequency converters are microprocessor controlled digitally programmable appliances. They are suitable for the nearly loss-free regulation of the rotation speed of any type of three phase 400 V cage motors with 0.55 kW - 200 kW motor power ratings, depending on the type.
The equipment complies with the standards concerning the control equipment in the electric industry.
(e.g. IEC 1000-4, IEC 1800-3, IEC 68-2, IEC 664-1, EN 55011 B1).

- **TECHNICAL DATA:**

Input:	Voltage:	3 x 380 ... 440VAC $\pm$ 10%
	Frequency:	50 ... 60Hz (sinusoidal)
Output:	Voltage:	3 x 0 to the Input voltage maximum (PWM modulated sinusoidal)
	Frequency:	0 ... 1000 Hz maximum (free programmable)
Protection class:		IP20 (at request IP54)
Power line interference suppression:		complies with standard EN 55011 CLASS B1 (built-in power line interference suppressor)
Ambient temperature:		0 ... +40 ^{o}C
Humidity:		max. 90 %, non-condensing.
Control side characteristics:		according to the programming manual.

- **TECHNICAL DESCRIPTION:**

The power line alternating voltage is rectified by a mains diode bridge, the pulsing voltage is filtered with electrolytic capacitors. The intelligent IGBT end stage, driven with sinusoidal modulated pulses, delivers to the motor a voltage altering in amplitude and frequency. Using the programming guide, up to the nominal rotation speed of the motor, the voltage vs. frequency ratio can be arbitrary altered according to the characteristics of the load. (E.g. at need of constant torque, linear voltage vs. frequency characteristics is to be used, whereas at need of torque changing proportionally with the frequency, use quadratic voltage vs. frequency characteristics.)
At low frequencies (1 to 10 Hz depending on the motor) this ratio can be modified for compensating for the ohmic voltage drops (U boost, f boost).
Beyond the nominal rotation speed the frequency converter can deliver constant power.
When needed, a brake resistor can be connected to the appliance.

The appliance consists of 3 distinct units

- **Main circuit power supply with line interference suppressor:**

This unit delivers the dc supply voltage for the converter unit and also contains the terminal blocks for connecting the line, the motor and at need the brake resistor.

- **Converter unit with internal power supply:**

This unit contains the intelligent IGBT end stage and the output current meter circuitry.
It also accommodates the 20 kHz switching mode power supply which delivers the supply voltages for the internal subunits (e.g. control unit, IGBT, serial lines etc.).

- **Control unit and microprocessor-based central unit:**

By this unit, the control and regulation signals coming through the serial lines (e.g. from push button terminal) or from the terminal blocks are processed for the microprocessor-based central unit and also signals are delivered for the converter and - through the terminal blocks and connectors - to the external units.

- **STARTING UP PROCEDURE:**

At request, against refund, the manufacturer takes the starting up procedure. Should the frequency converter started up by the customer, the manufacturer's installation instructions and the regulations of the relevant standards must be kept.
Life and property safety are only guaranteed when operated according to the connection diagrams and descriptions.
Inspection and maintenance by proper professional is the responsibility of the appliance's operator.
The manufacturer takes no responsibility for damages caused by incorrect connection.

- **Warnings:**

INACCURATE CONNECTION MAY CAUSE DAMAGE TO THE FREQUENCY CONVERTER!!

- The starting up procedure must not be made in wet environment or with wet hands!
- The supply voltage must not be connected to the motor terminal blocks!
- Avoid earthing or shorting the output terminal blocks!
- Phase compensator capacitor or LC, RC filters must not be used at the output!
- Avoid using magnetic switch at the output, because the frequency converter may stop operating with error due to the switch-on overcurrent. If for other reasons, use of the magnetic switch is necessary, (e.g. for switching over between motors), by logical lock inhibit the switch-over during the operation of the frequency converter!
- Always apply the earth connection according to the relevant standards!
- The cross section of the earth conductor must be at least equal to that of the prescribed phase conductors!
- The earth conductor must be as short as possible!
- The earth conductor must not be used jointly with other high power machines (e.g. welding machine, tool machine)!
- Avoid developing earth loops!

- **Notes:**

- When started with switching on the line power, avoid switching off and on frequently. The recovery time is about 3 seconds. This retards the quick start and the line rectifier may also be overloaded!
- Consider that at switching off the supply voltage the brake cannot function and the motor will stop with a free roll-out!
- If the frequency converter is operated from programming terminal or with pulse mode start command from the terminal blocks, the motor will not start automatically after switching on the line power (it waits for the start command)!
- If the frequency converter is connected to a high power transformer, or a phase compensator capacitor is connected to the power line, use of a line choke coil is recommended for protecting the rectifier!

- **Steps of the starting up procedure:**

- The frequency converter should comply with the descriptions in the manual!
- For changing the parameters the relevant programming manual is necessary (e.g. V 6.00)!
- The frequency converter must be placed according to the relevant installation instructions!
- Check up whether the available power line is appropriate for supplying the frequency converter (voltage, rated power capacity)!
- Connect the wires of the main circuitry and the control circuitry!
- Check up the right connections, fixings and runnings of the cables!
    (supply voltage cable, motor cable, control cables)
- If all other requirements of the operation are given, the frequency converter may be switched on.
- When using programming terminal or display, check up the right log-in! In case of error indication make troubleshooting according to the programming manual!
- If the system is not equipped with programming terminal or display (operating from the terminal blocks or with remote control), check up the back indication whether the supply voltage on the system exists (LED „ON")!
- Should the factory setting be not applicable make the necessary modifications using the programming terminal!
- By test run check up the right direction of the 00motor rotation and the control conditions!

- **PHYSICAL DIMENSIONS:** (ISD 0.55 - IHD 200)

PLACEMENT OF THE FREQUENCY CONVERTER
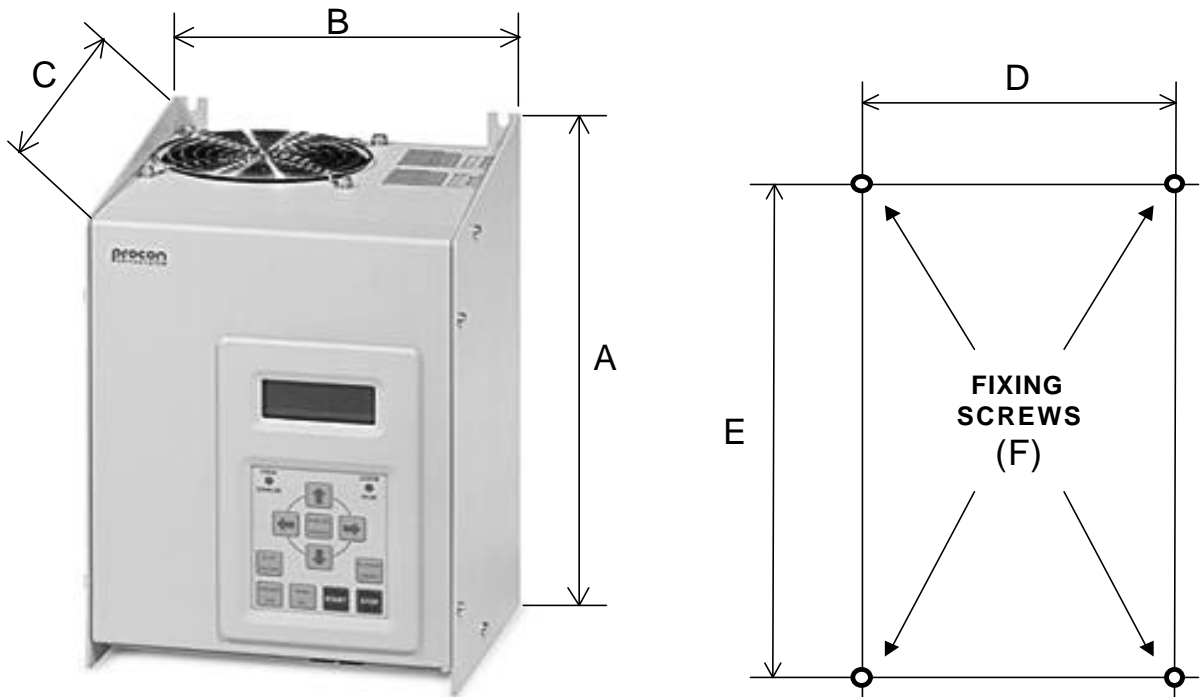
TYPE / DIMENSIONS	A	B	C	D	E	F
ISD 0.55 – 0.75	220	140	105	120	210	M4
ISD 1.1 – 1.5	220	140	135	120	210	M4
ILD 2.2 - 3	240	190	210	170	230	M5
ILD 4 - 5.5	290	190	220	170	280	M5
ILD 7.005 - 11	390	190	220	170	380	M5
ILD 15 - 22	490	290	250	260	470	M6
IHD 30 - 37	740	300	300	260	700	M8
IHD 45 - 55	740	400	300	360	700	M8
IHD 75	740	500	300	460	700	M8
IHD 90 - 110	900	500	320	460	850	M10
IHD 132 - 160	1100	500	360	460	1050	M10
IHD 200	1200	600	400	560	1140	M12

All dimensions are given in millimetres

- **TECHNICAL DATA:**

TYPE	Consumed power [kVA]	Input fuse [A]	Output power [kW]	Nominal current [A]	Peak current [A]	Mass [kg]	Minimum cross-section of the cable [mm^2]
THREE PHASE, 3 x 380…440VAC INPUT							
ISD 0.55	0.7	4	0.55	1.7	3	3	0.75
ISD 0.75	1	4	0.75	2.6	4	3	1
ISD 1.1	1.5	6.3	1.1	3.2	5	4	1
ISD 1.5	2	6.3	1.5	4.2	6	4	1.5
ILD 2.2	3	10	2.2	6	8	6	1.5
ILD 3	4	10	3	8	12	6	1.5
ILD 4	5.5	16	4	10	15	8	2.5
ILD 5.5	7.5	16	5.5	14	19	8	2.5
ILD 7.5	9	20	7.5	18	30	10	4
ILD 11	15	25	11	26	37	10	4
ILD 15	20	40	15	35	57	20	6
ILD 22	25	50	22	48	75	20	10
IHD 30	35	63	30	62	95	40	16
IHD 37	45	80	37	75	115	40	16
IHD 45	50	100	45	90	135	50	25
IHD 55	60	125	55	110	150	50	25
IHD 75	80	160	75	150	220	60	35
IHD 90	100	200	90	180	255	80	35
IHD 110	120	250	110	220	290	90	50
IHD 132	150	300	132	260	380	100	50
IHD 160	180	350	160	320	420	110	70
IHD 200	220	400	200	400	540	150	95

Note: The value of the consumed power is given as informative data only. Since the frequency converter can run with overload, the load capacity of the power line must exceed the nominal power consumption of the frequency converter.
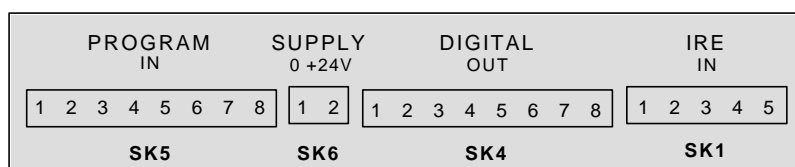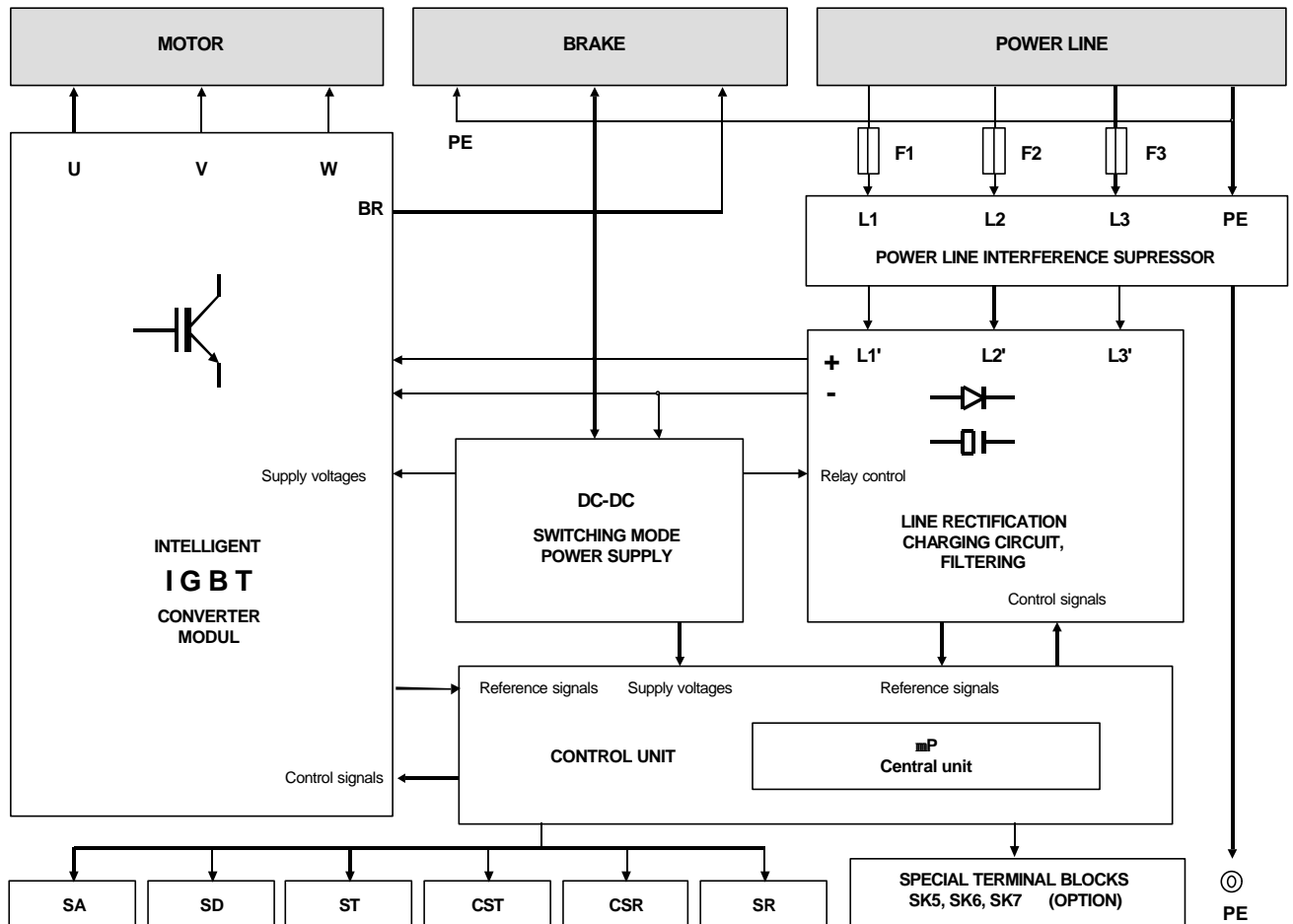
- **ISD operating interface:**
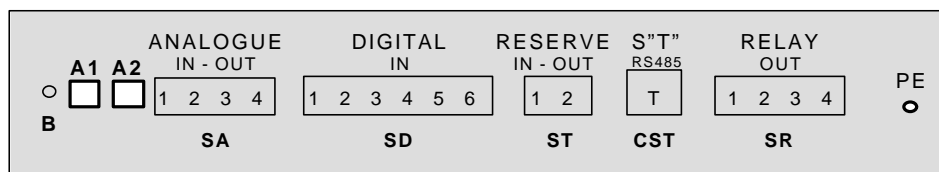
- **ILD and IHD operating interface:**

- **ILD and IHD optional operating interface:**

- **BLOCK DIAGRAM:**

- **MAIN CIRCUIT TERMINAL BLOCKS:**

Connect to the main circuit terminal blocks (according to the connection diagram and the labels) the power line phase conductors (L1, L2, L3) and the protecting earth (PE), as well as the motor phase conductors (U, V, W) and the protecting earth (PE).

Check up if the motor can be connected to 3 x 380 ... 440VAC!

If due to operation demands dynamic braking is needed, connect a brake resistor to the corresponding terminal blocks. Its value and power rating have to be conform to the braking demand!

(For its calculation see the programming manual)

During heavy braking the brake resistor becomes hot therefore it must be properly placed!

For the control wires make sure to use shielded cables and run them on a trace different from that of the main circuit cables! (SA, SD, ST, CST, SR etc.)

In order to reduce high frequency disturbances use of shielded motor cables is recommended. The shielding should be connected to PE potential at both ends.

The main circuit connections are arranged on the top of the frequency converter.

The connections are to be made with cables of proper cross-section, using a screwdriver!

7
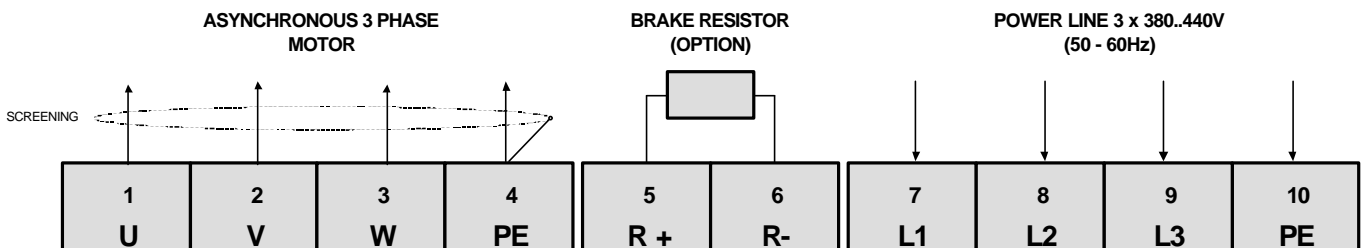
- **TERMINAL BLOCKS AND CONNECTORS OF THE CONTROL CIRCUITRY:**

The appliances of types ILD and IHD permit establishing double potential separation.
The control board performs the driving of the end stage and the internal signal processing (e.g. switching the end transistors on and off, measuring the temperature, measuring the motor current, transmitting the control signals etc.) with potential separation.
At each type (ISD, ILD, IHD) from the input side all signals are connected with potential separation to the control unit (e.g. analogue signals, digital signals, serial line).
It is important that these signals are separated from each other, too. This structure permits each signal to be earthed to its receiving system without forming unwanted earth loops.

- **Analogue signals terminal blocks: SA**
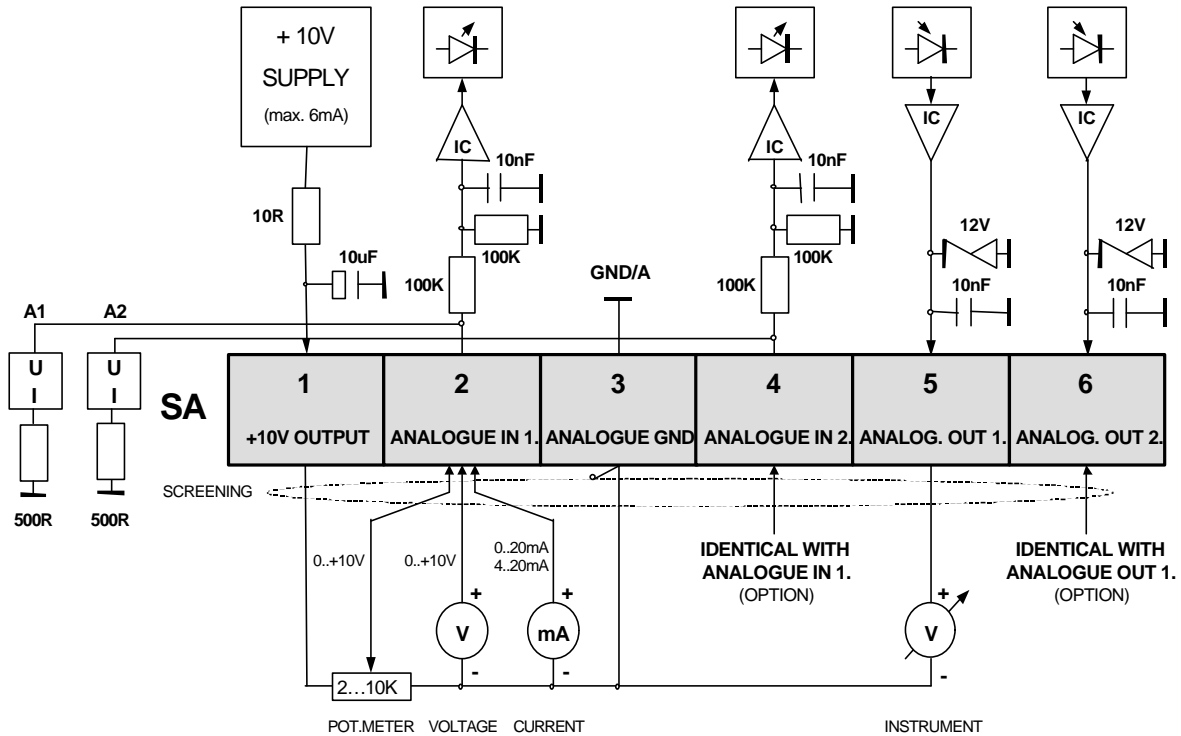
(SA1) +10V output (e.g. for potentiometer)
Stabilised output (max. 6mA) with short circuit protection. To be used for generating the reference signal with potentiometer.
Value of the potentiometer: 2…10 kohms

(SA2) Analogue IN 1. input
Potentiometer (scalable), voltage (0...10V variable), current (0...20mA variable).
Between voltage input (potentiometer) and current input, selection is made with jumper **"A1"**.
Note: Using current input, the limits (0…20mA or 4...20mA etc.) are to be set at programming.

(SA3) Reference 0V (analogue GND)
Reference point of the analogue inputs and outputs. (Also to be used for screening.)
When needed, it can be connected with the input digital GND (which e.g. is actually necessary at driving remote transmitters).

(SA4) Analogue IN 2. input (OPTION)
Potentiometer (scalable), voltage (0...10V variable), current (0...20mA variable).
Between voltage input (potentiometer) and current input, selection is made with jumper **"A2"**.
Note: Using current input, the limits (0…20mA or 4...20mA etc.) are to be set at programming.
This input can be used for any purpose the Analogue IN 1 input can.

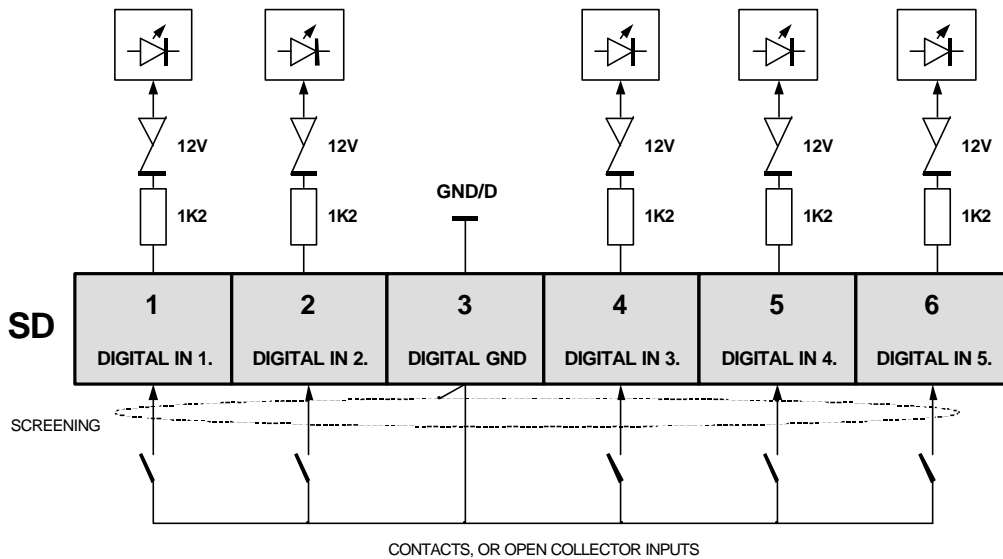**(SA5) Analogue OUT 1. output** (e.g. for displaying instrument)
It can be programmed to internal analogue values between 0 and 10 V, independently of the converter type, in % of the limit values (10V → 100%). The options can be selected at programming.

(SA6) Analogue OUT 2. output (OPTION)
If needed it can be used similarly to analogue output 1.

Note! Terminal blocks SA5, SA6 (analogue outputs) can only be included at types ILD and IHD!

- **Digital control signals terminal blocks:** SD

SD	1	2	3	4	5	6
	DIGITAL IN 1.	DIGITAL IN 2.	DIGITAL GND	DIGITAL IN 3.	DIGITAL IN 4.	DIGITAL IN 5.

SCREENING

CONTACTS, OR OPEN COLLECTOR INPUTS

All inputs can be driven with both positive and negative logic level. In basic state all inputs work with negative logic level (the active "0" is the switched on state. In this case, the digital GND potential must be led to the actual input). The inputs can receive contact or OC signal.

(SD1) Digital IN 1. (factory setting: **start switch**)
At programming, decision can be made whether the closed or open state (or pulse) should mean start.
Note: In case of frequent starts and stops this start/stop method is to be used. Start and stop with switching the power line on and off should be used at the starting up procedure only, or if starts/stops are made not more frequently than a few times (1 to 5 times) an hour.

(SD2) Digital IN 2. (factory setting: **direction**)
The output phase sequence of the frequency converter is defined. If this input is active, the phase sequence is reversed. If the output will be activated during operation, the frequency converter changes direction with the pre-programmed rising and fall times. The requested basic direction can be selected with the appropriate connection order of the motor phase wires at the MOTOR terminal blocks.
Changing the phase wires at terminal block POWER LINE
does not influence 00the direction of the motor rotation.

(SD3) Reference 0V (digital GND)
Reference point of the digital control inputs.

(SD4) Digital IN 3. (factory setting: **jog normal**)
The input is free programmable. For the programming options see the programming manual.

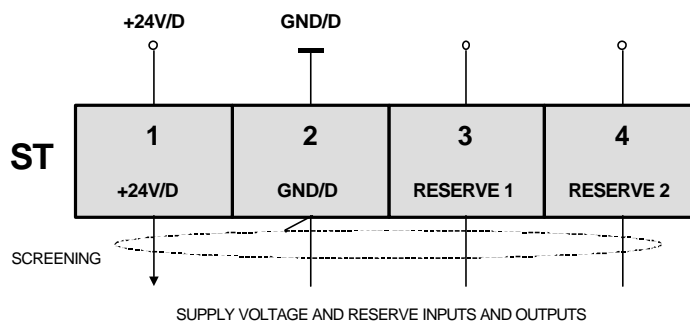**(SD5) Digital IN 4.** (factory setting: **acknowledgement**)
The input is free programmable. For the programming options see the programming manual.

(SD6) Digital IN 5. (factory setting: **external error**)
The input is free programmable. For the programming options see the programming manual.

Reserve terminal blocks: ST

These terminal blocks are provided for special purposes.

ST	1	2	3	4
	+24V/D	GND/D	RESERVE 1	RESERVE 2

SCREENING

SUPPLY VOLTAGE AND RESERVE INPUTS AND OUTPUTS

(ST1) **+24VDC supply voltage** (+24V/D, max. 50 mA load!)
For powering connected low power units (e.g. 4 ... 20mA remote sensor, IRE).
When used for analogue unit, the analogue and digital earth points are to be connected!

(ST2) **Reference 0V** (GND/D)
Digital reference point. In this case the GND belonging to the +24V supply voltage.

(ST3) **RESERVE 1** For connections at special demands (can only be included at types ILD and IHD!)

(ST4) **RESERVE 2** For connections at special demands (can only be included at types ILD and IHD!)

<u>Remark</u>: Reserve 1, 2 can be used for connecting further supply voltage e.g. ±15 V/Analogue, or incremental rotation speed encoder (IRE).

- **Terminal serial line connector: CST**

This 6-pin telephone socket (optionally 9-pin CANON socket) receives the primary (RS 485-T) serial line.
It permits the connection with the frequency converter's remote placed push button terminal, with a computer or with other frequency converters (e.g. at running multiple frequency converters with a single push button terminal).
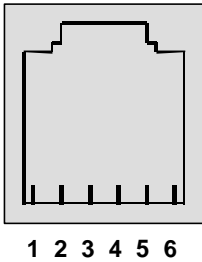
1 2 3 4 5 6

Attention!!

<u>To avoid erratic operation mind the followings</u>:
When connecting multiple frequency converters, encased terminal, serial line adapter etc. the <u>identical</u> pin assignment is always in the connector <u>socket</u>.
The wires of the connecting cable must connect the points of identical numbers (point 1 to point 1, point 2 to point 2 etc.).

(CST 1,2) **+9V/S** It provides the voltage supply for the push button terminal. At connected computer, it supplies the adapter of the serial line. (RS485 / RS232)

(CST 3) **B** Serial line signal wire

(CST 4) **A** Serial line signal wire

(CST5,6) **0V GND/S** Reference point of the serial line (and of +9V/S)

<u>Note</u>: The built-in push button terminal is connected to an internal connector which is connected in parallel with this connector.

- **System serial line connector: CSR** (can only be included at types ILD and IHD but from the digital inputs the serial lines can be switched over to system serial line!)

This 6-pin telephone socket receives the secondary (RS 485-R) serial line.
It permits the frequency converter to be connected with other frequency converters (in master/slave mode) and also the implementation of remote control tasks.
The RS 485-R system serial line cannot be used for other purposes.
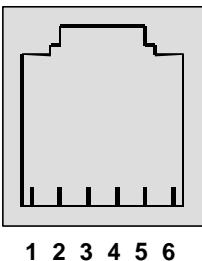
1 2 3 4 5 6

Attention!!

<u>To avoid erratic operation mind the followings</u>:
When connecting multiple frequency converters, serial line adapter etc. the <u>identical</u> pin assignment is always in the connector <u>socket</u>.
The wires of the connecting cable must connect the points of identical numbers (point 1 to point 1, point 2 to point 2 etc.).

**(CSR 1,2)** **+9V/S** It provides the voltage supply for the serial line adapter.

(CSR 3) **B** Serial line signal wire

(CSR 4) **A** Serial line signal wire

(CSR 5,6) **0V GND/S** Reference point of the serial line (and of +9V/S)

<u>Remark</u>: If the system is not equipped with system serial line, through this connector the RS 485-T serial line can be accessed. Use of connections through RS 485-T serial lines is more convenient.

- **Relay terminal blocks: SR**
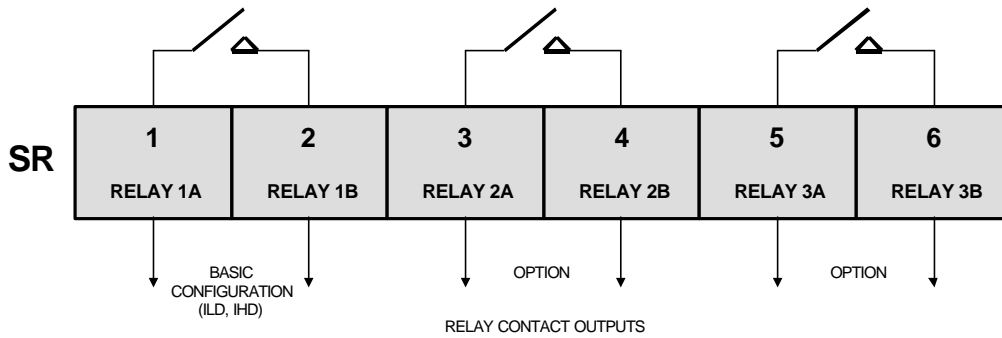
(SR 1, 2)   Relay 1 (BASIC CONFIGURATION)
Relay contact (operating contact). Load rating max. 250V/2A AC, or 24V/1A DC.
It is an accessory of the appliance. In default setting it indicates back the operation availability.
As described in the programming manual, signalization of other events can also be programmed.

(SR 3, 4)   Relay 2 (OPTION)
Relay contact (operating contact). Load rating max. 250V/2A AC, or 24V/1A DC.
The event to be signalised can be programmed as described in the programming manual.

(SR 5, 6)   Relay 3 (OPTION)
Relay contact (operating contact). Load rating max. 250V/2A AC, or 24V/1A DC.
The event to be signalised can be programmed as described in the programming manual.

- **OPTIONAL TERMINAL BLOCKS:** (CAN ONLY BE INCLUDED AT TYPES ILD AND IHD!)

- **Terminal blocks for the incremental rotation speed encoder IRE: SK1**

Input for the incremental rotation speed encoder.

For using to:
    regulation of the rotation speed
    position regulation
    torque regulation (with feedback)
    slip compensation (with feedback)
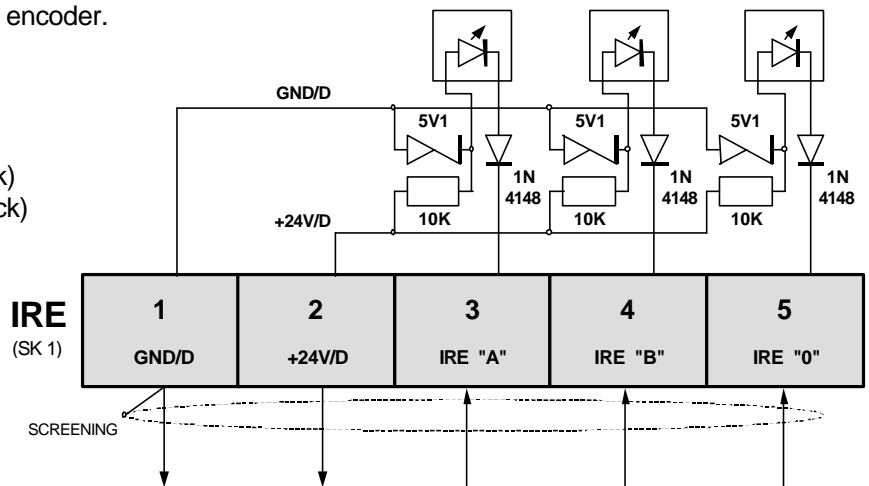
(SK 1/1)   GND/D

(SK 1/2)   +24V/D

(SK 1/3)   "A" input

(SK 1/4)   "B" input

(SK 1/5)   "0" input   (synchronous)

The SK 1/5 (synchronous input) is optional since it is not used by standard regulator arrangements.
The inputs can receive TTL, 24V, or open collector (active "0") signals (up to 50 kHz).
At the incremental rotation speed encoder, the division belonging to one revolution is to be chosen to that value at which the output does not exceed 50 kHz even at the highest required rotation speed.
E.g. an incremental rotation speed encoder with 1000 divisions can only be used up to 5000 revolutions.
 The incremental rotation speed encoder (IRE) can be powered from terminal block points SK1/1 and SK1/2.
 (GND/D and +24V/D)
Load rating of the power supply: maximum 50 mA.
Operational data of the inputs: +5V ... +24V DC voltage range, maximum 1.6 mA load per input.
   (For ISD: OC input, 8mA load per input. Output connection depending on demand, e.g. to ST,SD,SR)

- **Digital outputs terminal blocks: SK4**
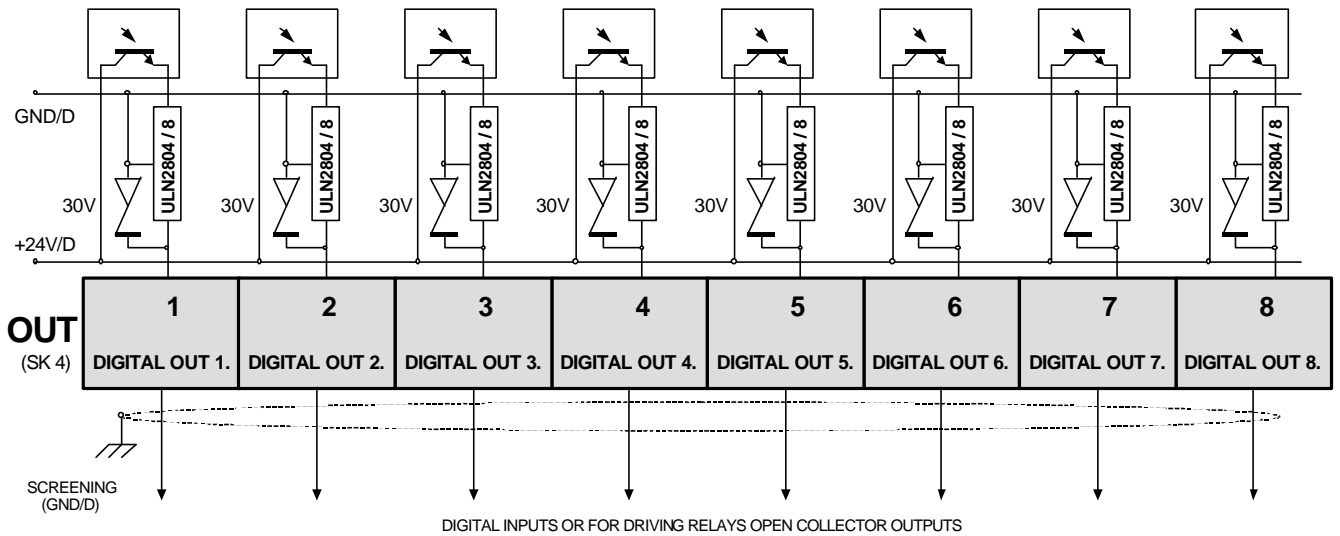
The outputs are of open collector type with a load capacity of 30V/100mA each.
To be used for driving inputs (e.g. PLC) or switching low power relays.
The relays must be powered from a separate power supply.
The reference **"0"** point is the GND/D (terminal block point SK8/1).

- **Supply voltage terminal blocks: SK8**

1	2
GND/D	+24V/D
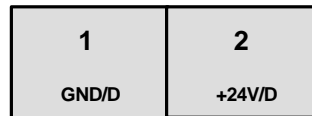
For powering the digital outputs and inputs

- **Program activating inputs terminal blocks: SK5**
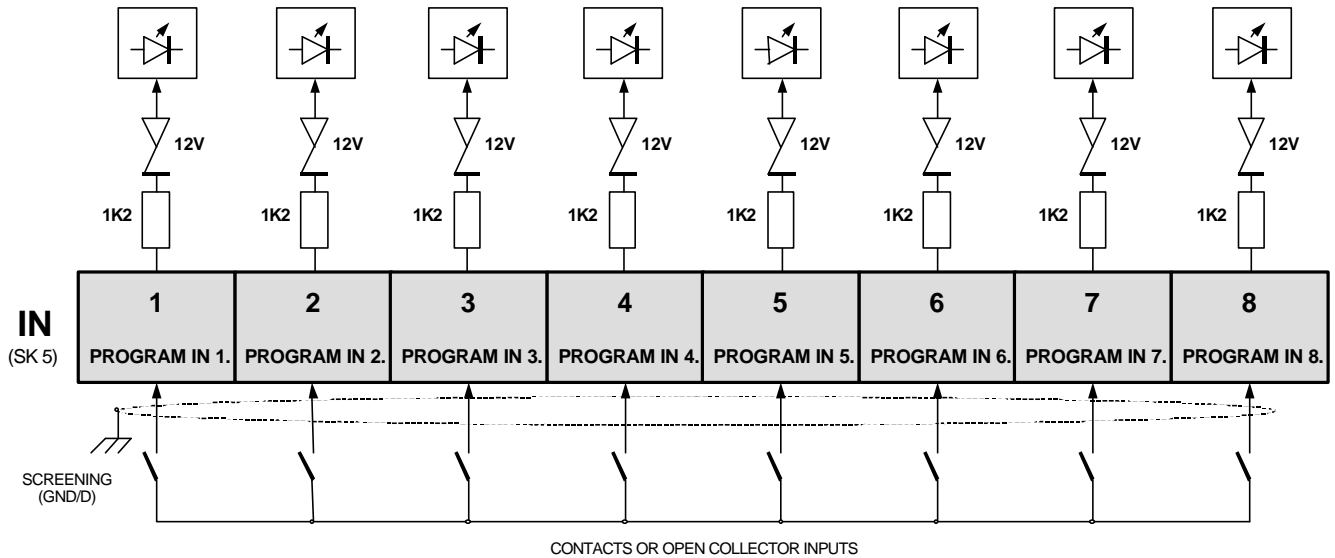
The inputs can operate with both positive and negative logic and even with mixed logic.
In default state they operate with negative logic, that is, active **"0"** level turns on the input.
(in this mode the GND/D potential is led to the input.)
Turning on with active **"1"** level is optional, and should be checked with the manufacturer.
(in this case the +24V/D potential is led to the input.)
The input can receive contact or OC signal.
The reference **"0"** point is the GND/D (terminal block point SK8/1).
Operational data: 24V DC operational voltage, maximum 8mA load at each input.

- **FINDING THE RIGHT PLACE FOR THE FREQUENCY CONVERTER:**

  - The frequency converter must not be installed in fire or explosion dangerous room or near to such materials!
  - External materials or things (liquids, metal pieces, thinner etc.) must not get into the appliance!
  - Install the frequency converter in clean environment, free of dust and oil mist. The temperature and humidity of the place of installation must also comply with the prescriptions given in this manual!
  - Protect the appliance from shock and vibration!
  - Keep the mounting distances given in the relevant drawing!
  - The frequency converter must be installed in vertical position, with assuring the proper ventilation!

The appliance belongs to protection class IP-20 and is allowed to be operated as a built-in unit only. Should the appliance need increased protection due to the conditions (water, dust, aggressive materials), use at least protection IP-54.
If the appliance is installed by the user, the issues cooling and arranging the cables need to be consulted with the manufacturer.
The manufacturer takes no responsibility for damages caused by incorrect installation.
Beside the side walls at least 50mm, below and above the unit at least 200 mm free space must be provided.
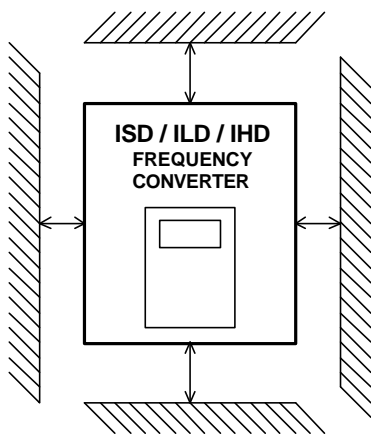
When installing the appliance into a closed control cabinet, the overheating of the inner room must be prevented.
At IP 54 versions, this is facilitated by increased heat sinks which are to be installed outside the closed cabinet, maintaining meanwhile the IP 54 protection.
At request the manufacturer takes the installation.
At types with forced ventilation (e.g. IHD models) ventilators with filter inset are to be used.
The inlet openings should be on the bottom side, the ventilated outlets on the upper side (possible diagonally).

- **STORAGE, TRANSPORTATION**

Storage and transportation of the appliance is only permitted in packaged state. On the package indicate the content's fragility and sensitivity to moisture.

- **MAINTENANCE, WARRANTY, REPAIR**

The appliance does not need any calibration, if the relevant transportation, storage and operation instructions are kept.

> ***Warranty period: 12 months***

Occasional repairs during the warranty period are made at the manufacturer's premises.
Transportation of the appliance is to be borne by the customer.
The warranty expires, if:
during the warranty period the frequency converter gets defective because of improper operation or storage, or due to the fault by the customer, or due to unauthorised interference (e.g. dismounting of the appliance).
In case of expired warranty and after the warranty period repairs are made by the manufacturer at the customer's expense.

Location of the premises performing repairs within and after the warranty period:

PROCON DRIVESYSTEM Ltd.

H-1047 Budapest, Sörétgyár u. 2., Hungary   Tel./Fax: +36 1 370 9699, +36 1 379 5387
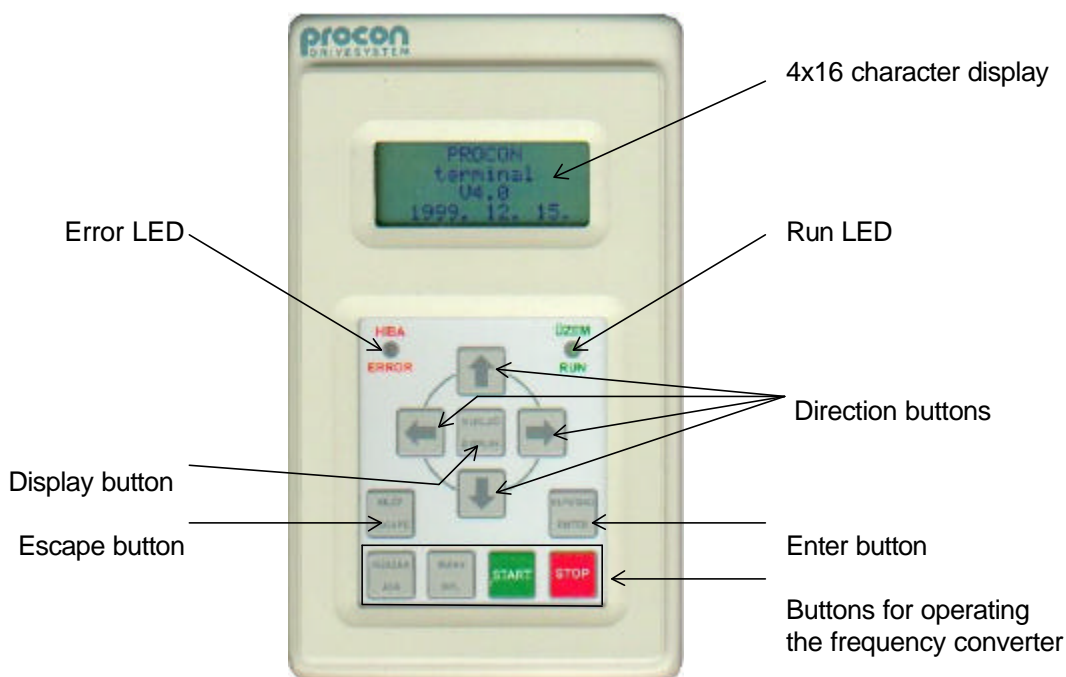
- **OPTIONS:**

- **Operating interface (Push button terminal):**

The operating interface is the program running on the PC and the push button terminal **(further on: terminal**). The PC and the terminal can be connected to the frequency converter simultaneously and they can be operated in parallel with each other. The connecting cable includes two signal wires and supply voltage.

The operating interface can be
        - built into the frequency converter (types ILD, IHD)
        - built into a separate box, to be used with types ISD, ILD and IHD.

After switching on, the terminal looks like shown in the following figure:

4x16 character display

Error LED

Run LED

Direction buttons

Display button

Escape button

Enter button

Buttons for operating
the frequency converter

The PC screen also displays the above figure, which can be operated in the same way as the terminal. The frequency converter is to be connected to the PC through the RS485-T serial line using an RS485 / RS 232 adapter.

The push buttons of the terminal are arranged in two groups:
        The upper group includes push buttons for the **four directions**, **"Display"**, **"Escape"** and **"Enter**".
        The lower group includes push buttons **"Jog"**, **" Display"**, **"Start"** and **"Stop"**.

The buttons of the upper group
permit moving among the menu items of the data setting and the data display, entering data and choosing the data to be displayed.

The buttons of the lower group
permit the control of the operation of the frequency converter in the case if the terminal has been selected for control. The lower four push buttons work independently of the upper ones, thus – if the control goes from the terminal – the motor can be stopped, started etc. during the setting of the data.

- **Quick programmer:**

Versions:
- Built into the front panel of the appliance (types ISD and ILD)
- Remote located according to the user's demand. (types ISD, ILD and IHD)

The four operating buttons (LEFT, DOWN, UP and RIGHT) perform two functions:

   - in case of error (the red Error LED flashes) the error can be acknowledged by pushing the RIGHT (Enter) button,
   - exit the displaying and enter the quick menu by pushing the LEFT (Escape) button.

In basic state the display shows the basic display: in its upper row the top row of the 4×16 character display, in its bottom row the lowest row of the 4×16 character display.
The buttons DOWN and UP permit choosing from the parameters of the quick menu. Changing is started with pushing the RIGHT (Enter) button then the cursor flashes at the character to be changed.
Saving the parameter is made by pushing the RIGHT button again, during the time the cursor flashes.
Exit without save is made by pushing the LEFT button, during the time the cursor flashes.
From the quick menu return to the basic display is made by pushing the LEFT button, or if the cursor does not flash the display returns in 5 seconds automatically to the basic display.
In case of error, if only the quick programmer or the display is connected, in the second row also the name of the error appears!

- **4 x 16 character display:**
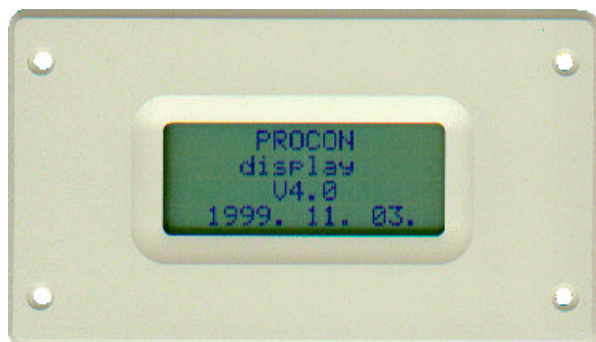
It shows the same display as the push button terminal. It is connected to the RS485-T serial line and can be built into the appliance or remote located e.g. onto the door of the control cabinet. It can operate also together with the terminal, because it only receives data and does not respond to the serial line.
Due to load reasons, two units only can be connected to the terminal serial line at the same time (two displays, display and terminal, or quick programmer and display).

In case of error, in the status indication in the first row the wording **! Error !** appears. In this case, if only a display is connected to the appliance, in the 4. row the name of the error is displayed (e.g. **Motor overcurrent**)!

- **2 x 16 character display:**

In basic state the display shows the basic display: in its first row the first row of the 4x16 character display, in its second row the fourth row of the 4x16 character display.
It can only built in the front panel of the ISD and ILD type appliances.

In case of error, in the status indication in the first row the wording **! Error !** appears. In this case, in the 2. row of the display the name of the error is displayed (e.g. **External error 1**)!

- **Computer connection:**

Using the ProContact software:

This Windows based software developed by Procon Ltd. permits setting the parameters and monitoring the operation behaviour of ISD, ILD and IHD type frequency converters.

The ProContact software is started from the Start menu.
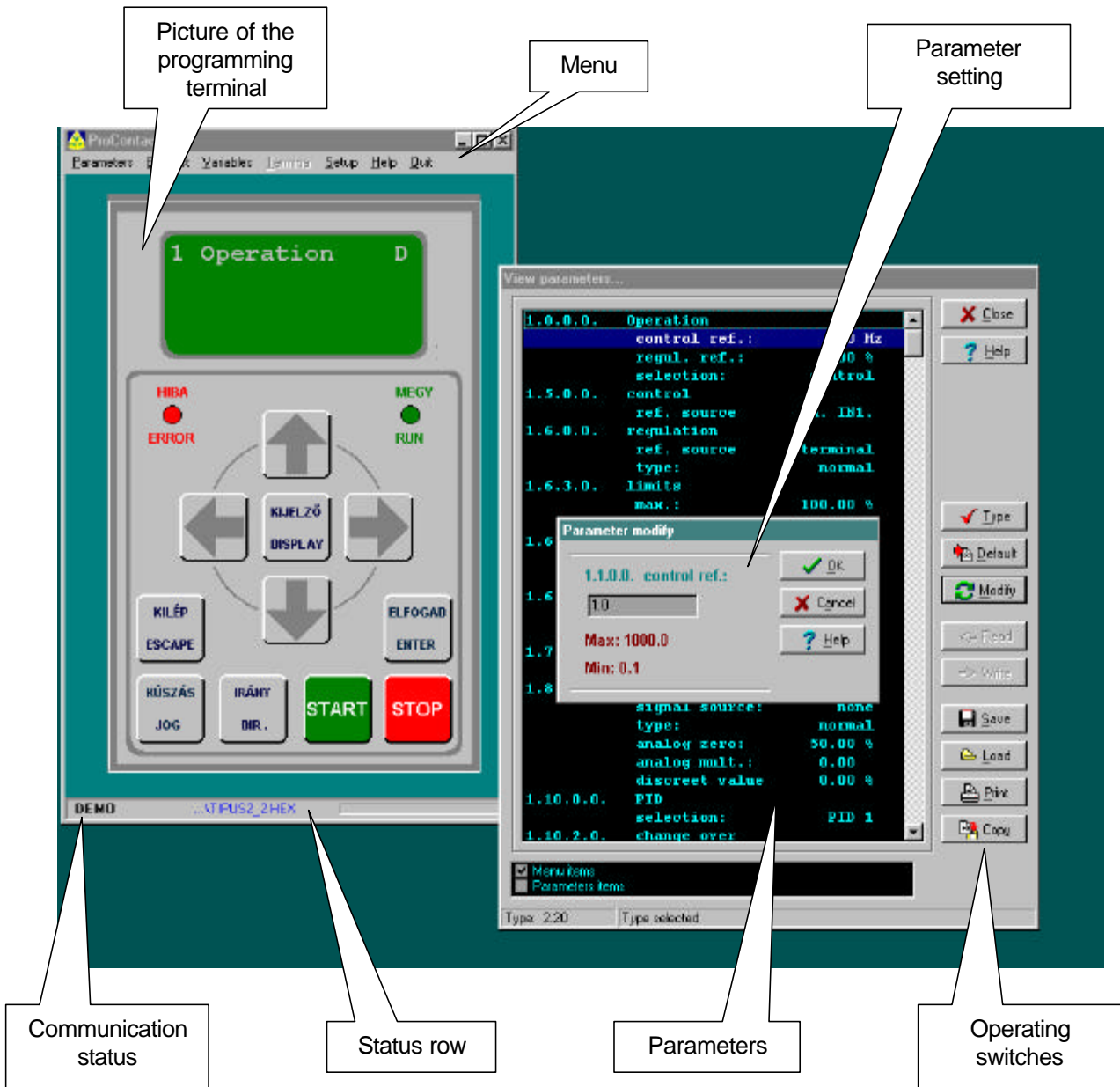
The picture of the programming terminal is active: by clicking the terminal buttons with the left mouse button the same tasks can be performed from the PC as from the programming terminal. The terminal buttons can be operated from the keyboard, too!

If the program simulates the operation of the frequency converter, the wording „DEMO" is displayed.

In the menu row further program windows can be activated (e.g. error log, oscilloscope etc.)