SIGMATEK

TT 1533

Multi-Touch Operating Terminal

Instruction Manual

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Publisher: SIGMATEK GmbH & Co KG
A-5112 Lamprechtshausen
Tel.: +43/6274/4321
Fax: +43/6274/4321-18
Email: office@sigmatek.at
WWW.SIGMATEK-AUTOMATION.COM

Translation from German

Multi-Touch Operating Terminal TT 1533

The TT 1533 is an intelligent terminal for programming and visualization of automated processes. Process diagnostics as well as operating and monitoring automated procedures are simplified using this terminal.

A projective capacitive touch screen serves as the input medium for process data and parameters. The output is shown on a 15" XGA TFT color display.

With the LSE mask editor, graphics can be created on the PC, then stored and displayed on the terminal.

The available interfaces can be used to exchange process data or configure the terminal. In the internal Flash memory, the operating system, application and application data are stored.

Contents

1 Technical Data

1.1 Performance Data

Processor	EDGE2 Technology
Processor cores	2[1)]
Internal cache	32-kbyte L1 Instruction Cache 32-kbyte L1 Data Cache 512-Kbyte L2 Cache
Internal program and data memory (DDR3 RAM)	512-Mbyte
Internal remnant data memory	512-kbyte MRAM
Internal storage device	4 GB microSD card (3D-TLC pSLC technology)[2)]
Internal I/O	no
Interfaces	4x USB 2.0, Type A (2x front, 2x back) 2x Ethernet (RJ45) 1x CAN bus (6-pin Weidmüller) not galvanically separated
Internal interface connections and devices	1x TFT LCD color display 1x USB (touch connection)
Display Resolution	15" TFT color display 1024 x 768 pixels
Control panel	Touch screen (projective capacitive)
Signal generator	no
Status LEDs	no
Real-time clock	no
Cooling	passive (fanless)

[1)] Attention: When programming (with LASAL) on multicore CPUs, particular focus must be placed on thread security!

[2)] The 4 GByte microSD card is formatted to 1 GByte in order to achieve the lifetime of a standard SLC card. A format change to the full 4 GByte is not allowed and will result in a massive reduction of the microSD card's life-time.

1.2 Electrical Requirements

Supply voltage	typically +24 V DC	
	minimum +18 V DC	maximum +30 V DC
Supply voltage (UL)	18-30 V DC (Class 2, LVLC) in preparation	
Current consumption of power supply (+24 V)	typically 500 mA (without externally connected devices)	maximum 1.2 A (with externally connected devices)
Inrush current	maximum 33 A for 25 µs	

The unit must be powered by a galvanically isolated source, which has a UL-certified secondary fuse with a maximum rated current of

a) max. 5 A at voltages from 0-20 V (0-28.3 Vp) or
b 100VA/Vp at voltages from 20-30 V (28.3-42.4 Vp).

1.3 Terminal

Dimensions	357.9 x 342.2 x 47.7 mm (W x H x D)
Material	Frame und front: aluminum / glass Backside: sheet steel
Weight	typically 5.10 kg

1.4 Environmental Conditions

Storage temperature	-10 ... +80 °C	
Operating temperature	0 … +50 °C	
Humidity	10-95 %, non-condensing	
EMC resistance	according to EN 61000-6-2 (industrial area)	
EMC noise generation	according to EN 61000-6-4 (industrial area)	
Vibration resistance	EN 60068-2-6	2-9 Hz: amplitude 3.5 mm 9-200 Hz: 1 g (10 m/s²)
Shock resistance	EN 60068-2-27	15 g (150 m/s²) duration 11 ms, 18 Shocks
Protection Type	Carrier arm mount with VESA75 whose connection also meets IP54	
	EN 60529 protected through the housing	front: IP54 rear panel: IP54

1.5 15" XGA Display

Type	15" TFT color display
Resolution	XGA, 1024 x 768 pixels
Color depth	262K colors
LCD mode	normally black[1)]
LCD polarizer	transmissive[2)]
Pixel size	0.297 x 0.297 mm
Number of pixels	1024*3 (RGB) x 768
Active surface	304.1 x 228.1 mm
Backlighting	LED
Contrast	typically 1500:1
Brightness	typically 400 cd/m²
Angle CR ≥ 10	left, right, below, above 85°
Life span	by compliance with the ambient conditions, the brightness of the display sinks after 50,000 operating hours to 50 % of the original brightness

[1)] If there is no display data, the display is black (LED backlight on)

[2)] Display technology, with which display backlighting is used.

Due to the production process of displays, defective pixels cannot be completely excluded!

1.6 Control Unit

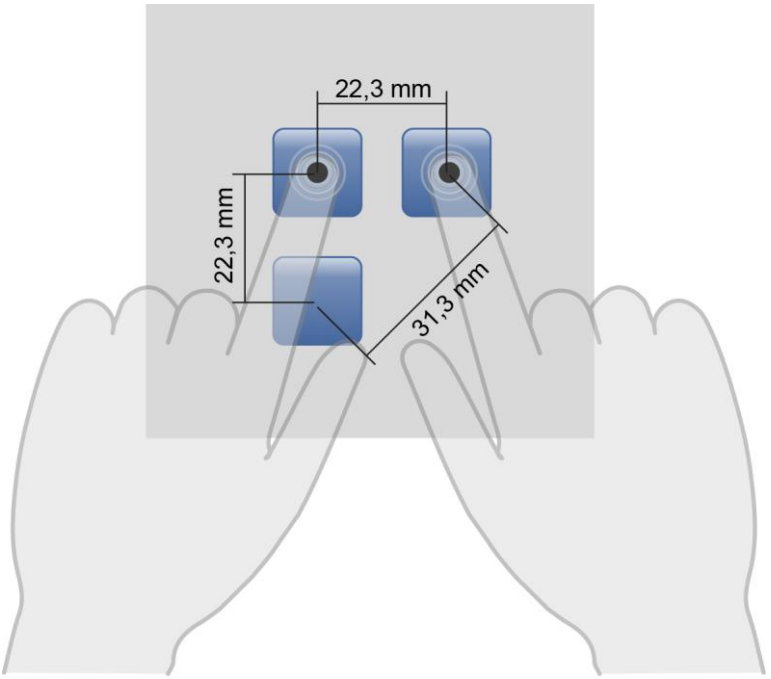
Touch panel	Projective capacitive glass touch panel
Sensor type	Film glass
Cleaning	see chapter: Cleaning the Touch Screen

The TT 1533 has a projective capacitive touch screen built in, with which 10-finger input, Zoom and gesture functions can be implemented. Data can be input using fingers, a projective capacitive touch pen and while wearing thin gloves. The device must always have a good ground connection so that the function of the touch screen is stable. In addition, it may be necessary to calibrate the touch screen for the respective environmental conditions.

The touch calibration data is stored in the TT 1533. After exchanging the microSD card, the touch screen must be recalibrated.

Distance needed for operating elements in multi-touch applications:

In order to guarantee smooth operation in multi-touch applications, buttons and control elements, which should be operated at the same time, must have the minimum distance shown below (depending on the estimated touch point).

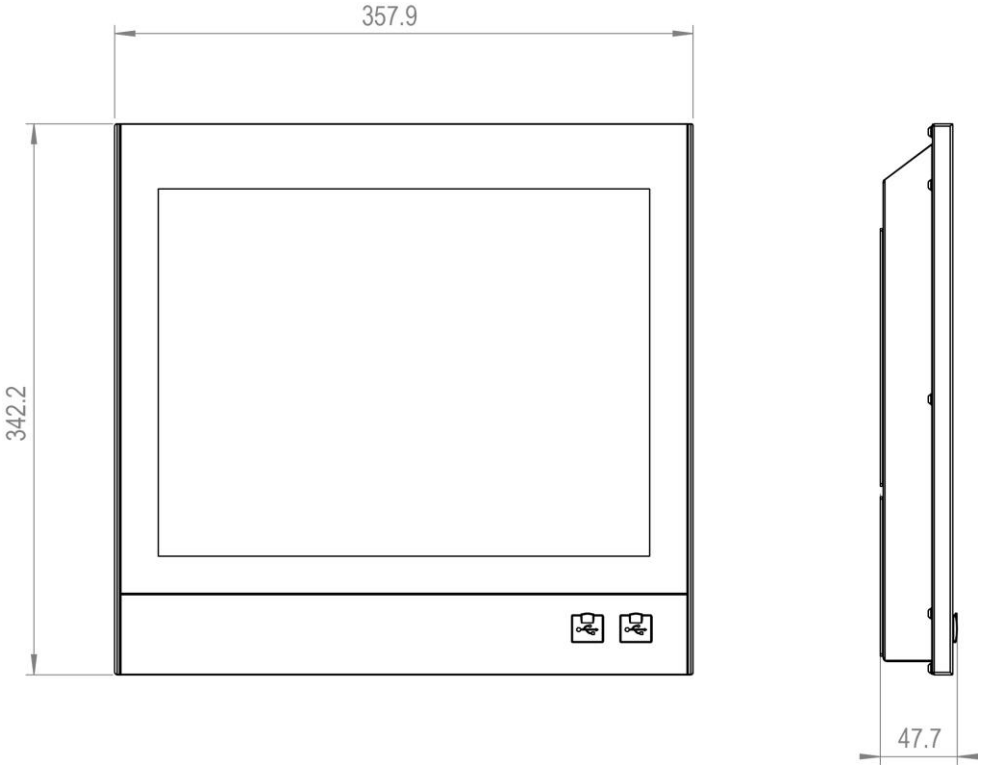


The size of the buttons and operating elements directly affect the operability of the application. Small operating elements should therefore be avoided.

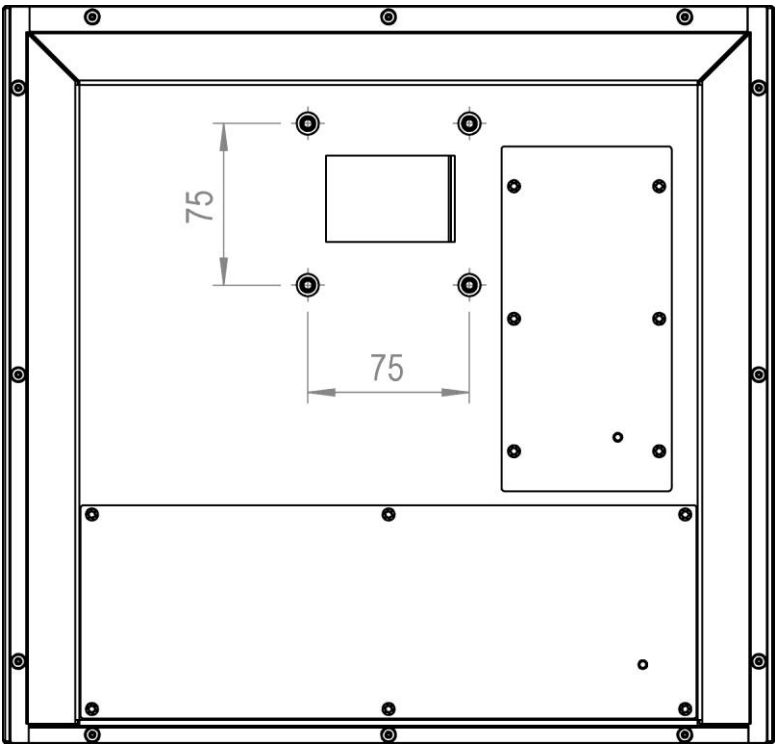
1.7 Miscellaneous

Article number	01-270-1533
Hardware version	1.x
Software version	9.x
Operating system	Salamander
Standard	designed according to UL
Approbations	UL, cUL, CE, UKCA

2 Mechanical Dimensions



2.1 Carrier Arm Mount



- IP54 only with VESA75 carrier arm whose connection meets IP54.

- VESA75 with M5 threads

3 Chemical Resistance

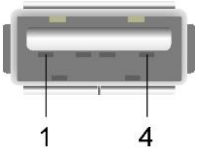
3.1 Glass Front

Solution	Visual Effect
Coal tar oil/toluene	None
Trichloroethylene	none
Acetone	none
Alcohol	none
Benzine	none
Machine oil	None
Glass cleaner	none
Mayonnaise	none
Ketchup	none
Wine	none
Salad oil	none
Vinegar	none
Lip stick	None
Ammonia	None

4 Connector Layout

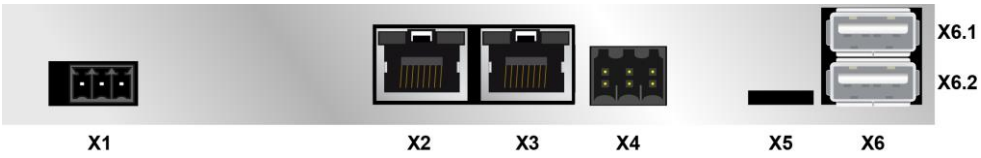
4.1 Front

X7, X8: USB Type A 2.0

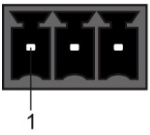


Pin	Function
1	VCC
2	D0-
3	D0+
4	GND

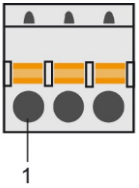
4.2 Backside



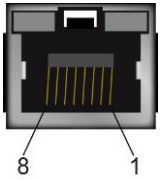
X1: Supply (3-pin Phoenix RM 3.5)



Pin	Function
1	+24 V DC
2	GND
3	GND



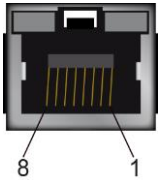
X2: Ethernet 10/100 (RJ45)



Pin	Function
1	Tx+
2	Tx-
3	RX+
4	n.c.
5	n.c.
6	RX-
7	n.c.
8	n.c.

n.c. = do not use

X3: Ethernet 10/100/1000 (RJ45)

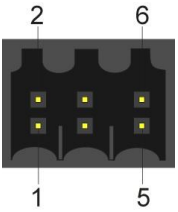


Pin	Function
1	DA+
2	DA-
3	DB+
4	DC+
5	DC-
6	DB-
7	DD+
8	DD-

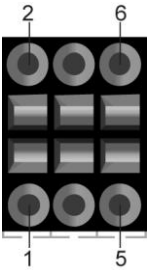
Problems can arise if a control is connected to an IP network, which contains modules that do not have a SIGMATEK operating system. With such devices, Ethernet packets could be sent to the control with such a high frequency (i.e. broadcasts), that the high interrupt load could cause a real-time runtime error or runtime error. By configuring the packet filter (Firewall or Router) accordingly however, it is possible to connect a network with SIGMATEK hardware to a third party network without triggering the problems mentioned above.

**For use in local networks only,
not in telecommunication circuits.**

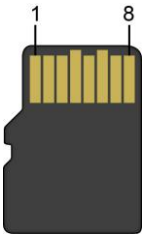
X4: CAN (6-pin Weidmüller RM 3.5)



Pin	Function
1	DAT2
2	CD/DAT3
3	CMD
4	+3V3
5	CLK
6	GND
7	DAT0
8	DAT1



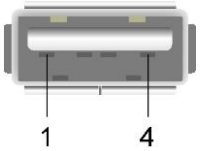
X5: microSD Card



It is recommended that only storage media provided by SIGMATEK (CompactFlash cards, microSD cards etc.) be used.
Order number for 4 GBbyte EDGE2: 12-630-105

The number of read and write actions have a significant influence on the lifespan of the storage media.

X6: 2x USB Type A 2.0



Pin	Function
1	VCC
2	D0-
3	D0+
4	GND

4.2.1 Applicable Connectors

X1: 3-pin Phoenix Contact plug with spring terminal FK-MCP 1.5/ 3-ST-3.5 (Included with delivery)
X2, X3: 8-pin RJ45 (not included in delivery)
X4: 6-pin Weidmüller plug B2L/B2CF 3.5/6 (included in delivery)
X6, X7, X8: USB 2.0 (Type A) (not included in delivery)

5 Cooling

The unit is designed for convection cooling.

6 Mounting Instructions

Mounting position: standing

Mounting is customer specific

7 Wiring Guidelines

7.1 Ground

The terminal must be connected to ground through the assembly on the control cabinet or over the connection provided. It is important to create a low-ohm ground connection, only then can error-free operation be guaranteed. The ground connection should have a maximum cross section and the largest (electrical) surface possible.

7.2 Shielding

For the Ethernet, CAT5 cables with shielded RJ45 connectors must be used. The shielding on the CAT5 cable is connected to ground via the RJ45 plug connector. Noise signals can therefore be prevented from reaching the electronics and affecting the function.

For CAN shielding is recommended.

7.3 ESD Protection

Typically, USB devices (keyboard, mouse) are not equipped with shielded cables. These devices are disrupted by ESD and in some instances, no longer function.

Before any device is connected to, or disconnected from the terminal, the potential should be equalized (by touching the control cabinet or ground terminal). This will allow the dissipation of electrostatic loads (caused by clothing/shoes).

7.4 USB Interface Connections

The terminal has USB host interfaces. The terminal has a USB interface connection that can be used to connect various USB devices (keyboard, mouse, storage media, hubs, etc.) in LASAL. Using a hub, several USB devices can be connected that are then fully functional in LASAL.

It should be noted that many of the USB devices on the market do not comply with USB specifications; this can lead to device malfunctions. This can lead to malfunction of the device. It is also possible that these devices will not be detected at the USB port or function correctly. Therefore, it is recommended that every USB stick be tested before actual use.

8 CAN Bus Setup

This section explains how to correctly configure the CAN bus. The following parameters must first be set: Station number and data transfer rate.

8.1 CAN Bus Station Number

Each CAN bus station is assigned its own station number. With this station number, data can be exchanged with other stations connected to the bus. In a CAN bus system however, each station number can only be assigned once!

8.2 Number of CAN Bus Participants

The maximum number of participants on the CAN bus depends on the cable length, termination resistance, data transfer rate and the drivers used in the participants.

With a termination resistance of 2x 20 Ω, a minimum of 100 participants are possible.

8.3 CAN Bus Data Transfer Rate

Various data transfer rates (baud rates) can be set on the CAN bus. The longer the bus line is, the lower the data transfer rate that must be selected.

Value	Baud Rate	Maximum Length
0	615 kbits/s[1)]	60 m
1	500 kbits/s	80 m
2	250 kbits/s	160 m
3	125 kbits/s	320 m
4	100 kbits/s	400 m
5	50 kbits/s	800 m
6	20 kbits/s	1200 m
7	1 Mbits/s	30 m

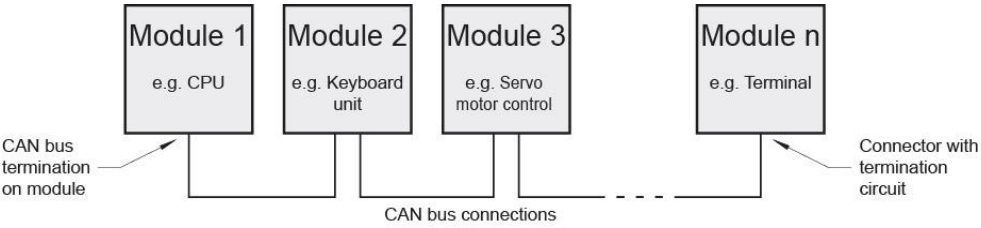
[1)] only between devices with EDGE2 technology

These values are valid for the following cable: 120 Ω, Twisted Pair.

Note: For the CAN bus protocol: 1 kbits/s = 1 kBaud

9 CAN Bus Termination

In a CAN bus system, both end modules must be terminated. This is necessary to avoid transmission errors caused by reflections in the line.



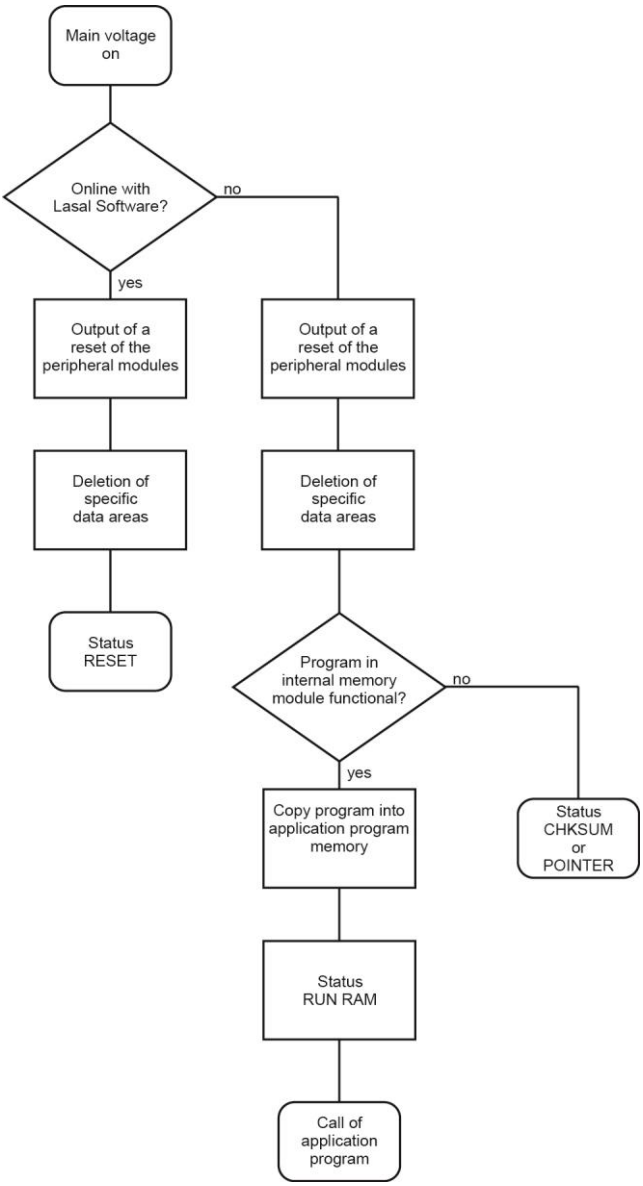
The terminal has a switchable 120 Ω terminating resistor for each CAN interface, which can be enabled and disabled via the application.

The termination is made by a switchable internal 120 Ωresistor between CAN A (LOW) and CAN B (HIGH).

9.1 CAN Not Galvanically Separated

CAN references the 24 V supply, which must be connected with PE.

10 Process Diagram



11 Status and Error Messages

Status and error messages are shown in the status test of the LASAL CLASS software. POINTER or CHKSUM messages can also be shown on the terminal screen.

Number	Message	Definition	Cause/solution
00	**RUN RAM**	The user program is currently running in RAM. The display is not affected.	INFO
01	**RUN ROM**	The user program stored in the program memory module loaded into the RAM is currently running. The display is not affected.	Info
02	**RUNTIME**	The total time for all cyclic objects exceed the maximum time; the time can be configured using two system variables: - Runtime: Remaining time - SWRuntime: Preset value for runtime counter	Optimize the application's cyclic task. Use higher capacity CPU Configure preset value
03	**POINTER**	Incorrect program pointers were detected before running the user program	Possible Causes: - The program memory module is missing, not programmed or defect. - The program in the user program memory (RAM) is not executable. - The user program has overwritten a software error. Solution: - Reprogram the memory module, if the error reoccurs exchange the module. - Correct programming error
04	**CHKSUM**	An invalid checksum was detected before running the user program.	Cause/solution: s. POINTER

05	**WATCHDOG**	The program was interrupted via the watchdog logic.	Possible Causes: - User program interrupts blocked over a longer period of time (STI command forgotten) - Programming error in a hardware interrupt. - INB, OUTB, INW, OUTW instructions used incorrectly. - The processor is defect. Solution: - Correct programming error. - Exchange CPU.
06	**GENERAL ERROR**	General error An error has occurred while stopping the application over the online interface.	The error occurs only during the development of the operating system.
07	**PROM DEFECT**	An error has occurred while programming the memory module.	Cause: - The program memory module is defect. - The user program is too large. - The program memory module is missing. Solution: - Exchange the program memory module
08	**RESET**	The CPU has received the reset signal and is waiting for further instructions. The user program is not processed.	INFO
09	**WD DEFEKT**	The hardware monitoring circuit (watchdog logic) is defective. After power-up, the CPU checks the watchdog logic function. If an error occurs during this test, the CPU deliberately enters an infinite loop from which no further instructions are accepted.	Solution - Exchange CPU.
10	**STOP**	The program was stopped by the programming system.	
11	**PROG BUSY**	Reserved	
12	**PROGRAM LENGTH**	Reserved	

13	**PROG END**	A memory module was successfully programmed.	Info
14	**PROG MEMO**	The CPU is currently programming the memory module.	INFO
15	**STOP BRKPT**	The CPU was stopped by a breakpoint in the program.	INFO
16	**CPU STOP**	The CPU was stopped by the programming software.	INFO
17	**INT ERROR**	The CPU has triggered a false interrupt and stopped the user program or has encountered an unknown instruction while running the program.	Cause: - A nonexistent operating system was used. - Stack error (uneven number of PUSH and POP instructions). - The user program was interrupted by a software error. Solution: - Correct programming error.
18	**SINGLE STEP**	The CPU is in single step mode and is waiting for further instructions.	INFO
19	**READY**	A module or project has been sent to the CPU and it is ready to run the program.	INFO
20	**LOAD**	The program is stopped and the CPU is currently receiving a new module or project.	INFO
21	**UNZUL. MODULE**	The CPU has received a module that does not belong to the project.	Solution: - Recompile and download the entire project
22	**MEMORY FULL**	The operating system memory /Heap) is too small. No memory could be reserved while calling an internal or interface function is called from the application.	Cause: - Memory is only allocated but not released. Solution - Clear memory
23	**NOT LINKED**	When starting the CPU, a missing module or a module that does not belong to the project was detected.	Solution: - Recompile and download the entire project

24	**DIV BY 0**	A division error has occurred.	Possible Causes: - Division by 0. - The result of a division does not fit in the result register. Solution: - Correct programming error.
25	**DIAS ERROR**	While accessing a DIAS module, an error has occurred.	Hardware problem
26	**WAIT**	The CPU is busy.	INFO
27	**OP PROG**	The operating system is currently being reprogrammed.	INFO
28	**OP INSTALLED**	The operating system has been reinstalled.	INFO
29	**OS TOO LONG**	The operating system cannot be loaded; too little memory.	Restart; report error to SIGMATEK.
30	**NO OPERATING SYSTEM**	Boot loader message. No operating system found in RAM.	Restart; report error to SIGMATEK.
31	**SEARCH FOR OS**	The boot loader is searching for the operating system in RAM.	Restart; report error to SIGMATEK.
32	**NO DEVICE**	Reserved	
33	**UNUSED CODE**	Reserved	
34	**MEM ERROR**	The operating system loaded does not match the hardware configuration.	Solution: - Use the correct operating system version
35	**MAX IO**	Reserved	
36	**MODULE LOAD ERROR**	The LASAL Module or project cannot be loaded.	Solution: - Recompile and download the entire project
37	**BOOTIMAGE FAILURE**	A general error has occurred while loading the operating system.	Contact SIGMATEK
38	**APPLMEM ERROR**	An error has occurred in the application memory (user heap).	Solution: - Correct allocated memory access error
39	**OFFLINE**	This error does not occur in the control.	This error code is used in the programming system to show that there is no connection to the control.
40	**APPL LOAD**	Reserved	

41	**APPL SAVE**	Reserved	
44	**VARAN MANAGER ERROR**	An error number was entered In the VARAN manager and stopped the program.	Solution: - Read log file
45	**VARAN ERROR**	A required VARAN client was disconnected or communication error has occurred.	Solution: - Read LogFile - Error Tree
46	**APPL-LOAD-ERROR**	An error has occurred while loading the application.	Cause: - Application was deleted. Solution: - Reload the application into the control.
47	**APPL-SAVE-ERROR**	An error has occurred while attempting to save the application.	
50	**ACCESS-EXCEPTION-ERROR**	Read or write access of a restricted memory area. (I.e. writing to the NULL pointer).	Solution: - Correct application errors
51	**BOUND EXCEEDED**	An exception error has occurred when accessing arrays. The memory area was overwritten through accessing an invalid element.	Solution: - Correct application errors
52	**PRIVILEDGED INSTRUCTION**	An unauthorized instruction for the current CPU level was given. For example, setting the segment register.	Cause: - The application has overwritten the application program code. Solution: - Correct application errors
53	**FLOATING POINT ERROR**	An error has occurred during a floating-point operation.	
60	**DIAS-RISC-ERROR**	Error from the Intelligent DIAS Master.	Restart; report error to SIGMATEK.
64	**INTERNAL ERROR**	An internal error has occurred, all applications are stopped.	Restart; report error to SIGMATEK.
65	**FILE ERROR**	An error has occurred during a file operation.	
66	**DEBUG ASSERTION FAILED**	Internal error.	Restart; report error to SIGMATEK.

67	**REALTIME RUNTIME**	The total duration of all real-time objects exceeds the maximum time; the time cannot be configured. 2 ms for 386 CPUs 1 ms for all other CPUs	Solution: - Optimize the application's real-time task (RtWork). - Reduce the clock time for the real-time task of all objects. - Correct application errors - CPU is overloaded in real-time => use a higher capacity CPU.
68	**BACKGROUND RUNTIME**	The total time for all background objects exceed the maximum time; the time can be configured using two system variables: -BTRuntime: Remaining time -SWBTRuntime: Preset value for runtime counter	Solution: - Optimize the application's background task (background) - Use higher capacity CPU - Set SWBTRuntime correctly
70	**C-DIAS ERROR**	A connection error with a C-DIAS module has occurred.	Cause: - The cause of the error is documented in the log file Solution: - This depends on the cause
72	**S-DIAS ERROR**	A connection error with an S-DIAS module has occurred.	Possible Causes: - real network does not match the project - S-DIAS client is defective Solution: - analyze log file
75	**SRAM ERROR**	An error occurred while initializing, reading or writing SRam data.	Possible Causes: - SRam configured incorrectly - Battery fort he internal program memory supply is empty Solution: - Analyze log file (Event00.log, Event19.log) - Check configuration - Change internal program memory supply battery
95	**USER DEFINED 0**	User-definable code.	
96	**USER DEFINED 1**	User-definable code.	
97	**USER DEFINED 2**	User-definable code.	
98	**USER DEFINED 3**	User-definable code.	

99	**USER DEFINED 4**	User-definable code.	
100	**C_INIT**	Initialization start; the configuration is run.	
101	**C_RUNRAM**	The LASAL project was successfully started from RAM.	
102	**C_RUNROM**	The LASAL project was successfully started from ROM.	
103	**C_RUNTIME**		
104	**C_READY**	The CPU is ready for operation.	
105	**C_OK**	The CPU is ready for operation.	
106	**C_UNKNOWN_CID**	An unknown object from a stand-alone or embedded object, or an unknown base class was detected.	
107	**C_UNKNOWN_CONSTR**	The operating system class cannot be created; the operating system is probably wrong.	
108	**C_UNKNOWN_OBJECT**	Indicates an unknown object in an interpreter program; more the one DCC080 object.	
109	**C_UNKNOWN_CHNL**	The hardware module number is greater than 60.	
110	**C_WRONG_CONNECT**	No connection to the required channels.	
111	**C_WRONG_ATTR**	Wrong server attributes.	
112	**C_SYNTAX_ERROR**	Non-specific error. Recompile and download all project sections.	
113	**C_NO_FILE_OPEN**	An attempt was made to open an unknown table.	
114	**C_OUTOF_NEAR**	Memory allocation error	
115	**C_OUT OF_FAR**	Memory allocation error	
116	**C_INCOMAPTIBLE**	An object with the same name already exists but has a different class.	
117	**C_COMPATIBLE**	An object with the same name and class exists but must be updated.	
224	**LINKING**	The application is currently linking.	
225	**LINKING ERROR**	An error has occurred while linking. An error messaged is generated in the LASAL status window.	
226	**LINKING DONE**	Linking is complete.	

230	**OP BURN**	The operating system is burned into the Flash memory	
231	**OP BURN FAIL**	An error has occurred while burning the operating system.	
232	**OP INSTALL**	The operating system is currently being installed.	
240	**USV-WAIT**	The power supply was disconnected; the UPS is active. The system is shutdown.	
241	**REBOOT**	The operating system is restarted.	
242	**LSL SAVE**		
243	**LSL LOAD**		
252	**CONTINUE**		
253	**PRERUN**	The application is started.	
254	**PRERESET**	The application is ended.	
255	**CONNECTION BREAK**		

12 Cleaning the Touch Screen

CAUTION!
Before cleaning the touch screen, the terminal must first be turned off to avoid unintentionally triggering functions or commands!

The terminal's touch screen can only be cleaned with a soft, damp cloth. A screen cleaning solution such as an anti-static foam, water with a mild detergent or alcohol should be used to dampen the cloth. The cleaning solution should be sprayed onto the cloth and not directly onto the terminal. The cleaning solution should not be allowed to reach the terminal electronics, for example, through the ventilation slots.

No erosive cleaning solutions, chemicals, abrasive cleansers or hard objects that can scratch or damage the touch screen may be used.

If the terminal comes into contact with toxic or erosive chemicals, carefully clean the terminal immediately to prevent corrosion!

To ensure the optimal function of the terminal, the touch screen should be cleaned at regular intervals!

To extend the lifespan of the touch screen as much as possible, using the fingers to operate the terminal is recommended.

13 Disposal

To dispose of the product, the respective, possibly country-dependent, guidelines must be met and followed.

Documentation Changes

Change date	Affected page(s)	Chapter	Note
25.11.2020	4	1.1 Performance Data	Footnote cores (programming) added
23.05.2022	13	4.2 Backside	X6.1, X6.2 defined
06.12.2022	9	1.7 Miscellaneous	UKCA conformity
11.01.2024	16	4.2.1 Applicable Connectors	B2CF added
13.03.2024	4 15	1.1 Performance Data 4.2 Backside	microSD card updated