

# Installation and User Guide

CTS 602 by Nilan

VPM 360



## Modbus

Version: 2.00 08-05-2014  
Software-version: 2.20 →

The following information describes how to connect to Nilan CTS 602 controls by means of a RS485 connection:

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## Connection:

The Modbus is connected to PIN 2,3,6 on CN7 placed next to the USB port of the printed circuit board

Pin 1	12 VDC output
Pin 2	COM1 - RS 485 A - Modbus
Pin 3	COM1 - RS 485 B - Modbus
Pin 4	COM2 - RS 485 A - User panel
Pin 5	COM2 - RS 485 B - User panel
Pin 6	Ground

## Setup:

Protocol	Modbus (RTU mode), see <a href="http://www.modbus.org/specs.php">http://www.modbus.org/specs.php</a>
Node address	Default 30, Address is selectable between 1 and 247 To be changed I SERVICE Menu.
Device type	CTS 602 is a Modbus slave
Baud rate	19.200
Databits	8
Stopbits	1
Parity	Even
Packet size	Max. 255 bytes

The communication speed and parameter can not be changed.

## Supported functions:

Input and holding registers are supported.  
All registers are 16 bit size.

The controller will respond to the below listed Modbus message functions only.  
Please note that no other function codes are supported.

Function	Name	Description
03	Read Holding Registers	Read one or more holding registers
04	Read Input Registers	Read one or more input registers
16	Preset Multiple Registers	Write one or more holding registers

## Register layout:

Register addresses are specified as decimal numerals.

Input registers are placed in the address area 30001..39999.

Holding registers are placed in the address area 40001..49999.

### NOTE:

In the following tables, the register addresses applied in the MODBUS messages are without the global offset. This means that if you read input register 100 with function code 04, you will get the global address 30101.

### NOTE:

All input registers can also be read as type holding register with function code 03 by adding the offset value 10000 to the register address. No writes will be accepted in this range.

## Register groups

The protocol data is grouped into the following address ranges with 100 registers in each group. This applies to both input and holding register types:

Name	Address	Description	VPM	VPL	VP	VGU	COMF
Device	000	Protocol and controller setup	x	x	x	x	x
Discrete I/O	100	Input / output bits (on/off)	x	x	x	x	x
Analog I/O	200	Input / output words	x	x	x	x	x
Time	300	Clock and calendar	x	x	x	x	x
Alarm	400	Alarm and message handling	x	x	x	x	x
Week program	500	Calendar based programming	x	x	x	x	x
User functions	600	User input function selection	x	x	x	x	x
--	700	--					
--	800	--					
--	900	--					
Control	1000	System control and status	x	x	x	x	x
AirFlow	1100	Ventilation control	x	x	x	x	x
AirTemp	1200	Room temperature control	x	x	x		x
AirBypass	1300	Exchanger bypass control			x		x
AirHeat	1400	Inlet air heater control	x	x			x
Compressor	1500	Compressor operation control	x	x	x	x	
Defrost	1600	Defrosting control	x	x	x	x	x
HotWater	1700	Hot water control			x	x	
CentHeat	1800	Central water heat control (EK)			x	x	
AirQual	1900	Air quality control (RH, CO2)	x	x	x	x	x
User panel	2000	Display and keyboard	x	x	x	x	x
PreHeat	2100	Intake air preheat / earth tube			x		x

## Input registers:

Name	Address	Scale	Unit	Description	Used to plant type
Bus.Version	000			Protocol version number	All plants
App.VersionMajor	001		text	Software version - major (2 character ascii text)	All plants
App.VersionMinor	002		text	Software version - minor (2 character ascii text)	All plants
App.VersionRelease	003		text	Software version - release (2 character ascii text)	All plants
Input.UserFunc	100			User function	All plants
Input.AirFilter	101			Air filter alarm	VPM-Comfort-Comforti
Input.DoorOpen	102			Door contact	VPM-Comforti
Input.Smoke	103			Fire/Smoke alarm	All plants
Input.MotorThermo	104			Motor thermo fuse	VPM-Comforti
Input.Frost_Overht	105			Heating surface frost / overheat	VPL-VPM-Compact-Comfort-Comforti
Input.AirFlow	106			Airflow monitor (guard)	VPL-VPM-Compact-Comfort-Comforti
Input.P_HI	107			High pressure switch	All Plants
Input.P_LO	108			Low pressure switch	Not in use
Input.Boil	109			Hot water boiling	VGU-VP-Compact
Input.3WayPos	110			Hot water 3-way valve position	Not in use
Input.DefrostHG	111			Hotgas defrost type selection	Not in use
Input.Defrost	112			Defrost thermostat	VPL-VPM-VGU-VP-Compact
Input.UserFunc_2	113			User function 2	VPL-VGU-VP-Compact-Comfort
Input.T0_Controller	200	100	°C	Controller board temperature	All plants
Input.T1_Intake	201	100	°C	Fresh air intake temperature	VPL-VPM-VGU-VP-Compact
Input.T2_Inlet	202	100	°C	Inlet temperature (before heater)	VPL-VPM-VP-Compact-Comfort-Comforti
Input.T3_Exhaust	203	100	°C	Room exhaust temperature	Comfort-Comforti
Input.T4_Outlet	204	100	°C	Outlet temperature	Compact-Comfort-Comforti
Input.T5_Cond	205	100	°C	Condenser temperature	VPL-VPM-VP-Compact
Input.T6_Evap	206	100	°C	Evaporator temperature	VPL-VPM-VGU-VP-Compact
Input.T7_Inlet	207	100	°C	Inlet temperature (after heater)	VPL-VPM-VP-Compact-Comfort-Comforti

Input.T8_Outdoor	208	100	°C	Outdoor temperature	Comfort-Comforti
Input.T9_Heater	209	100	°C	Heating surface temperature	VPL-VPM-Comfort-Comforti
Input.T10_Extern	210	100	°C	External room temperature	All plants
Input.T11_Top	211	100	°C	Hot water top temperature	VGU-VP-Compact
Input.T12_Bottom	212	100	°C	Hot water bottom temperature	VGU-VP-Compact
Input.T13_Return	213	100	°C	EK return temperature	VGU-VP
Input.T14_Supply	214	100	°C	EK supply temperature	VGU-VP
Input.T15_Room	215	100	°C	User panel room temperature	All plants
Input.T16	216	100	°C	AUX temperature (sacrificial anode)	VGU-VP-Compact
--	217..220			(reserved)	
Input.RH	221	100	%	Humidity	All plants
Input.CO2	222		ppm	Carbon dioxide	All plants

Alarm.Status	400			Alarm state bit mask 0x80 : Active 0x03 : Nb. of alarms	All
Alarm.List_1_ID	401			Alarm 1 - Code	All
Alarm.List_1_Date	402			Alarm 1 - Date	All
Alarm.List_1_Time	403			Alarm 1 - Time	All
Alarm.List_2_ID	404			Alarm 2 - Code	All
Alarm.List_2_Date	405			Alarm 2 - Date	All
Alarm.List_2_Time	406			Alarm 2 - Time	All
Alarm.List_3_ID	407			Alarm 3 - Code	All
Alarm.List_3_Date	408			Alarm 3 - Date	All
Alarm.List_3_Time	409			Alarm 3 - Time	All
Control.RunAct	1000			Actual on/off state 0 : Off 1 : On	All
Control.ModeAct	1001			Actual operation mode 0 : Off 1 : Heat 2 : Cool 3 : Auto 4 : Service	All
Control.State	1002			Actual control state 0 : Off 1 : Shift 2 : Stop 3 : Start 4 : Standby 5 : Ventilation stop 6 : Ventilation 7 : Heating 8 : Cooling 9 : Hot water 10 : Legionella 11 : Cooling + hot water 12 : Central heating 13 : Defrost	All

				14 : Frost secure 15 : Service 16 : Alarm	
Control.SeclnState	1003		Sec	Actual time in state	All
AirTemp.IsSummer	1200			Summer state 0 : Off 1 : On	All
AirTemp.TempInlet Set	1201	100	°C	Inlet temperature request (T7 setpoint)	All
AirTemp.TempControl	1202	100	°C	Actual value for controlled temperature	All
AirTemp.TempRoom	1203	100	°C	Actual room temperature (T15 or T10)	All
AirTemp.EffPct	1204	100	%	Passive heat exchanger efficiency	Compact-Comfort-Comforti
AirTemp.CapSet	1205	100	%	Requested capacity	All plants
AirTemp.CapAct	1206	100	%	Actual capacity	All plants
Display.LED_1	2000			User panel indicator light	All plants
Display.LED_2	2001				All plants
Display.Text_1_2	2002		ascii	Text line 1 character 1-2	All plants
Display.Text_3_4	2003		ascii		All plants
Display.Text_5_6	2004		ascii		All plants
Display.Text_7_8	2005		ascii		All plants
Display.Attr_1_8	2006			Text line 1 flags	All plants
Display.Text_9_10	2007		ascii	Text line 2 character 9-16	All plants
Display.Text_11_12	2008		ascii		All plants
Display.Text_13_14	2009		ascii		All plants
Display.Text_15_16	2010		ascii		All plants
Display.Attr_9_16	2011			Text line 2 flags	All plants

## Holding registers:

Name	Address	Scale	Unit	Description	Used to plant type
Bus.Address	0			Protocol node address (default = 30)	All plants
Output.AirFlap	100			Air flap	VPL-VPM-VGU-VP-Comfort-Comforti
Output.SmokeFlap	101			Fire/Smoke flap	VPM-Comforti
Output.BypassOpen	102			Bypass flap open	Compact-Comfort-Comforti
Output.BypassClose	103			Bypass flap close	Compact-Comfort-Comforti
Output.AirCircPump	104			Air heat circulation pump	VPM-Comfort-Comforti
Output.AirHeatAllow	105			Air heating selected	VPL-VPM-Compact-Comfort-Comforti
Output.AirHeat_1	106			Air heater relays	VPM-Comforti
Output.AirHeat_2	107			--	VPM-Comforti
Output.AirHeat_3	108			--	VPM-Comforti
Output.Compressor	109			Compressor	VPL-VPM-VGU-VP-Compact
Output.Compressor_2	110			Compressor 2	Not in use
Output.4WayCool	111			4-way valve	VPL-VPM-VGU-Compact
Output.HotgasHeat	112			Hotgas valve - heat	VPM
Output.HotgasCool	113			Hotgas valve - cool	VPM
Output.CondOpen	114			Air condenser active	Compact
Output.CondClose	115			Air condenser inactive	Compact
Output.WaterHeat	116			Hot water heater	VGU-VP-Compact
Output.3WayValve	117			Hot water 3-way valve	Not in use
Output.CenCircPump	118			EK circulation pump	VGU-VP
Output.CenHeat_1	119			EK heater relays	VGU-VP
Output.CenHeat_2	120			--	VGU-VP
Output.CenHeat_3	121			--	VGU-VP
Output.CenHeatExt	122			External radiator heat	VPL-VP-Compact-Comfort
Output.UserFunc	123			User function active	All plants
Output.UserFunc_2	124			--	VPL-VGU-VP-Compact-Comfort
Output.Defrosting	125			Defrost function active	All plants
Output.ExhaustSpeed	200	100	%	Exhaust fan speed	All plants
Output.InletSpeed	201	100	%	Inlet fan speed	VPL-VPM-VP-Compact-Comfort-Comforti
Output.AirHeatCap	202	100	%	Air heater capacity	VPL-VPM-Compact-Comfort-Comforti



Output.CenHeatCap	203	100	%	Central heater capacity	VGU-VP
Output.CprCap	204	100	%	Compressor capacity	VPL-VPM-VGU-VP-Compact
Output.EarthSpeed	205	100	%	Earth tube air intake fan speed	VPcCoB
Time.Second	300		ss	Second	All plants
Time.Minute	301		nn	Minute	All plants
Time.Hour	302		hh	Hour	All plants
Time.Day	303		dd	Day	All plants
Time.Month	304		mm	Month	All plants
Time.Year	305		yyyy	Year	All plants
Alarm.Reset	400			Clear one specific alarm code or all 0 : No command 1..99 : (reserved internal commands) 101..199 : Clear alarm display code 1..99 255 : Clear all alarms	All plants
Program.Select	500			Week program nb. select 0 : None 1 : Program 1 2 : Program 2 3 : Program 3 4 : Erase	All plants
Program.UserFuncAct	600			User function active (See "UserFuncSet")	All plants
Program.UserFuncSet	601			User function select 0 : None 1 : Extend 2 : Inlet 3 : Exhaust 4 : External heater offset 5 : Ventilate	All plants
Program.UserTimeSet	602			Min User function period	All plants
Program.UserVentSet	603			Step User function ventilation 0 : Off 1..4 : Step number	All plants
Program.UserTempSet	604		°C	User function temperature (Extend function only)	All plants
Program.UserOffsSet	605		°C	User function temperature (Offset function only)	All plants
Program.User2FuncAct	610			Same as user function 1 above	VPL-VGU-VP-Compact-Comfort

Program.User2FuncSet	611			--	VPL-VGU-VP-Compact-Comfort
Program.User2TimeSet	612			--	VPL-VGU-VP-Compact-Comfort
Program.User2VentSet	613			--	VPL-VGU-VP-Compact-Comfort
Program.User2TempSet	614			--	VPL-VGU-VP-Compact-Comfort
Program.User2OffsSet	615			--	VPL-VGU-VP-Compact-Comfort
Control.Type	1000			Machine type select	Do not use
Control.RunSet	1001			User on / off select 0 : Off 1 : On	All plants
Control.ModeSet	1002			User operation mode select 0 : Off 1 : Heat 2 : Cool 3 : Auto 4 : Service	All plants
Control.VentSet	1003		Step	User ventilation step select 0 : Off 1..4 : Step number	All plants
Control.TempSet	1004	100	°C	User temperature setpoint	All plants
Control.ServiceMode	1005			Service mode select 0 : Off 1 : Defrost 2 : Flaps 3 : Inlet 4 : Exhaust 5 : Compressor 6 : Heating 7 : Hot water 8 : Central heat	All plants
Control.ServicePct	1006	100	%	Service mode capacity	All plants
Control.Preset	1007			Request preset to factory settings 0 : Ready 1 : Preset 2 : Backup (to user file) 3 : Restore (from user file)	All plants
AirFlow.AirExchangeMode	1100			Air exchange mode 0 : Energy 1 : Comfort 2 : ComfortWater	VPL-VPM-VGU-VP-
AirFlow.CoolVent	1101		Step	Cooling high ventilation step	VPL-VPM-VP-Compact-Comfort-Comforti
AirTemp.CoolSet	1200		°C	Cooling temperature setpoint select	VPL-VPM-VP-Compact-Comfort-Comforti

AirTemp.TempMinSum	1201		°C	Inlet temp. min. summer	VPL-VPM-VP-Compact-Comfort-Comforti
AirTemp.TempMinWin	1202		°C	Inlet temp. min. winter	VPL-VPM-VP-Compact-Comfort-Comforti
AirTemp.TempMaxSum	1203		°C	Inlet temp. max. summer	VPL-VPM-Comfort-Comforti
AirTemp.TempMaxWin	1204		°C	Inlet temp. max. winter	VPL-VPM-Comfort-Comforti
AirTemp.TempSummer	1205		°C	Summer/winter limit	VPL-VPM-VP-Compact-Comfort-Comforti
HotWater.TempSet_T11	1700		°C	Top temperature setpoint	VGU-VP-Compact
HotWater.TempSet_T12	1701		°C	Bottom temperature setpoint	VGU-VP-Compact
CentralHeat.HeatExtern	1800		°C	External heating offset from room temperature setpoint	VPL-VP-Compact-VPcCoB-
AirQual.RH_VentLo	1910		Step	AirQual.RH_VentLo 1910 Step Humidity low winter step select	All plants
AirQual.RH_VentHi	1911		Step	Humidity high step select	All plants
AirQual.RH_LimLo	1912	100	%	Humidity limit for low ventilation	
AirQual.RH_TimeOut	1913		min	Humidity max. time on high ventilation	All plants
AirQual.CO2_VentHi	1920		Step	CO2 high step select	All plants
AirQual.CO2_LimLo	1921		ppm	CO2 limit for normal ventilation	All plants
AirQual.CO2_LimHi	1922		ppm	CO2 limit for high ventilation	All plants
Display.KeyCode	2000			User panel keypress Combined value with one bit for each key 0x01 : ESCAPE 0x02 : UP 0x04 : DOWN 0x08 : ENTER 0x10 : OFF 0x20 : ON	All plants

## Communication example

The sample shown below is a general Modbus communication example, and is not specific for this device.

Request: 0b041000000e75a4

Response: 0b041cffff0000095008b0e4a80014000b000108e108f1ffff000f0002fff39f8e'

### Request (Input register)

0x0b	Slave addr	1 byte
0x04	Function code	1 byte
0x1000	Start addr	2 bytes
0x000e	Quantity	2 bytes
0x75a4	CRC	2 bytes

### Response

0x0b	Addr	1 byte
0x04	Function code	1 byte
0x1c	NB bytes of data	1 byte
0xffff	Value1	2 bytes
0x0000	Value2	2 bytes
0x0950	Value3	2 bytes
0x08b0	Value4	2 bytes
0xe4a8	Value5	2 bytes
0x0014	Value6	2 bytes
0x000b	Value7	2 bytes
0x0001	Value8	2 bytes
0x08e1	Value9	2 bytes
0x08f1	Value10	2 bytes
0xffff	Value11	2 bytes
0x000f	Value12	2 bytes
0x0002	Value13	2 bytes
0xfff3	Value14	2 bytes
0x9f8e	CRC	2 bytes

Request 0b03200000018f60

Response: 0b030200002045

### Request (Holding register)

0x0b	Slave addr	1 byte
0x03	Function code	1 byte
0x2000	Address	2 bytes
0x0001	Quantity	2 bytes
0x8f60	CRC	2 bytes

### Response

0x0b	Slave addr	1 byte
0x03	Function code	1 byte
0x02	Quantity	1 byte
0x0000	Value1	2 bytes
0x2045	CRC	2 bytes

## Alarm list

Alarms are divided into these categories:

INFO: Information can be confirmed with the same

WARNING: Warning, may become critical if the problem are not corrected

CRITICAL: Critically, operation is stopped until the fault is corrected and the alarm is acknowledged

RS: Restart (automatic restart when errors are OK, if selected by menu)

SC: Self clearing (when receipted pending state again is OK)

See specification and user manual for each plant for a further description of alarms.

Code	Text	Type	Subsystem	Function
0	NONE	NONE	System	No alarm
1	HARDWARE	CRITICAL	System	Electrical faults (eg, Ur-circuit)
2	TIMEOUT	CRITICAL	System	A WARNING has been critically
3	FIRE	CRITICAL	AirFlow	Fire thermostat
4	PRESSURE	CRITICAL + RS	Compressor	High or low pressure pressure switch
5	DOOR	CRITICAL + SC	AirFlow	Inspection door open
6	DEFROST	INFO	Defrost	Defrosting time exceeded (compressor)
7	FROST	CRITICAL	AirTemperature	Plants without T9 sensor: - Water coil freeze thermostat triggered Systems with T9 sensor - Water surface could not reach 20 ° C within 6 min.
8	FROST	CRITICAL + SC	AirTemperature	Only plants with T9 sensor - Water coil freeze thermostat triggered
9	OVERTEMP	INFO + SC	CentralHeat	Kettle over temperature (TMax +10 ° C)
10	OVERHEAT	INFO + SC	AirHeat	Electric reheating overheating
11	AIRFLOW	INFO + SC	AirHeat	Electric reheating lack of air flow
12	THERMO	CRITICAL	AirFlow	Ventilation Motor thermal switch
13	BOILING	CRITICAL	HotWater	DHW Water boiling
14	SENSOR	CRITICAL	AirTemperature	Elected steered sensor is defect
15	ROOM LOW	CRITICAL	AirFlow	Room temperature below the set minimum. Winter protection (reduced ventilation) is without effect.
16	SOFTWARE	INFO	System	Program startup / main loop
17	WATCHDOG	INFO	System	Program execution errors
18	CONFIG	INFO	System	Database content changed - check settings (eg after software update)
19	FILTER	INFO	AirFlow	Air filter pressure switch or timer
20	LEGIONEL	INFO	HotWater	Legionella Function not executed within the time limit for the allowed number of attempts
21	POWER	INFO	System	Power outage longer than the backup time on clock circuit
22	T AIR	INFO	AirTemperature	Air temperature errors
23	T WATER	INFO	HotWater	DHW temperature errors
24	T HEAT	INFO	CentralHeat	Central heating temperature errors
25	MODEM	INFO	System	Communication error modem (only CTS 600 G1)

26	INSTABUS	INFO	System	Communication errors network (CTS 600 G1)
27	T1SHORT	CRITICAL	System	Temperature sensor shorted
28	T1OPEN	CRITICAL	System	Temperature sensor disconnected
29	T2SHORT	CRITICAL	System	Temperature sensor shorted
30	T2OPEN	CRITICAL	System	Temperature sensor disconnected
31	T3SHORT	CRITICAL	System	Temperature sensor shorted
32	T3OPEN	CRITICAL	System	Temperature sensor disconnected
33	T4SHORT	CRITICAL	System	Temperature sensor shorted
34	T4OPEN	CRITICAL	System	Temperature sensor disconnected
35	T5SHORT	CRITICAL	System	Temperature sensor shorted
36	T5OPEN	CRITICAL	System	Temperature sensor disconnected
37	T6SHORT	CRITICAL	System	Temperature sensor shorted
38	T6OPEN	CRITICAL	System	Temperature sensor disconnected
39	T7SHORT	CRITICAL	System	Temperature sensor shorted
40	T7OPEN	CRITICAL	System	Temperature sensor disconnected
41	T8SHORT	CRITICAL	System	Temperature sensor shorted
42	T8OPEN	CRITICAL	System	Temperature sensor disconnected
43	T9SHORT	CRITICAL	System	Temperature sensor shorted
44	T9OPEN	CRITICAL	System	Temperature sensor disconnected
45	T10SHORT	CRITICAL	System	Temperature sensor shorted
46	T10OPEN	CRITICAL	System	Temperature sensor disconnected
47	T11SHORT	CRITICAL	System	Temperature sensor shorted
48	T11OPEN	CRITICAL	System	Temperature sensor disconnected
49	T12SHORT	CRITICAL	System	Temperature sensor shorted
50	T12OPEN	CRITICAL	System	Temperature sensor disconnected
51	T13SHORT	CRITICAL	System	Temperature sensor shorted
52	T13OPEN	CRITICAL	System	Temperature sensor disconnected
53	T14SHORT	CRITICAL	System	Temperature sensor shorted
54	T14OPEN	CRITICAL	System	Temperature sensor disconnected
55	T15SHORT	CRITICAL	System	Temperature sensor shorted
56	T15OPEN	CRITICAL	System	Temperature sensor disconnected
57	T16SHORT	CRITICAL	System	Temperature sensor shorted
58	T16OPEN	CRITICAL	System	Temperature sensor disconnected
70	ANODE	INFO + SC	HotWater	DHW tank anode corroded and needs replacing (The alarm is deactivated by lice or disconnection)
71	EXCH INFO	INFO	Defrost	Defrost time exceeded (exchanger)
90	SLAVE IO	CRITICAL + SC	System	(not relevant for the CTS 602)
91	OPT IO	INFO + SC	System	Options Module missing
92	PRESET	INFO	System	Error while writing or reload installer settings (PRESET menu)

## Revision history

Version	Software	Date	Description
1	2.00.q	22-04-2009	Initial version
2	2.11.e	11-05-2010	Rearranged User Function data layout Added User Function 2
3	2.12a	03-06-2011	Added Control. Preset selections Backup and Restore
4	2.16a	16-02-2012	Added earth tube air intake temperature and fan speed (Plan type VPcCoB), Alarm.Reset, and 17 other setpoints from 1101 to 1922.
5	2.20.b	16-11-2013	Added reading of input registers as type holding Added preheater and alarm relay outputs

“Version” refers to the protocol data item named “Bus.Version”.

# Connection diagram

