



Instalare Modbus si instructiuni de operare pentru senzori

VA 500 / VA 520 si VA 550 / VA 570



I. Cuvant inainte

Draga client,

Va multumim pentru decizia luata in favoarea cumpararii instrumentului VA 5xx. Va rugam sa cititi cu mare atentie acest manual de instalare si operare, inainte de montarea si punerea in functiune, urmand in totalitate sfaturile noastre. Functionarea corecta si fara riscuri a VA 5xx este garantata numai daca au fost respectate in totalitate instructiunile si precizarile din acest manual.



Distribuitor autorizat pentru Romania:

TEST LINE SRL

Str. Agricultori, nr. 119
RO-030342, Bucuresti
Tel./Fax: 021 321 04 38
Mobil: 0744 516 844
E-mail: office@testline.ro
Web: www.cs-instruments.com

Birou vanzari SUD - Germania

Zindelsteiner Str. 15
D-78052 VS-Tannheim
Tel.: +49 (0) 7705 978 99 0
Fax: +49 (0) 7705 978 99 20
Mail: info@cs-instruments.com
Web: www.cs-instruments.com

Birou vanzari NORD - Germania

Am Oxer 28c
D-24955 Harrislee
Tel.: +49 (0) 461 700 20 25
Fax: +49 (0) 461 700 20 26
Mail: info@cs-instruments.com
Web: www.cs-instruments.com

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Instructiuni

1 Instructiuni

Acest manual contine instructiuni necesare pentru instalarea si utilizarea senzorilor VA5xx cu functia MODBUS. Aceasta functie permite unui dispozitiv Master sa citeasca online valorile masurate de senzorii VA5xx.

Acest manual nu are ca scop prezentarea completa a protocolului MODBUS RTU si se presupune ca utilizatorul este familiarizat deja cu comunicarea pe MODBUS RTU, in special cu configurarea si operarea dispozitivului Master.

Totusi, in capitolele urmatoare a fost inclusa si o prezentare generala a acestui tip de protocol.

1.1 Definitii si abrevieri

CRC	Cyclic Redundancy Check Utilizat pentru verificarea erorilor in MODBUS RTU - vedeti Anexa
Modbus Master	Dispozitiv MODBUS care este capabil sa acceseze datele din unul sau mai multe dispozitive MODBUS Slave conectate.
Modbus Slave	Dispozitiv MODBUS care este capabil sa raspunda unei cereri primita de la un singur dispozitiv MODBUS Master
Modbus Address	In aceasta documentatie se foloseste urmatoarea notatie pentru adresa Registre MODBUS RTU – vedeti Capitolul 8 Adresare: Registrul tampon 1009 este adresat cu mesaje cu 1008
PDU	Unitate date cu protocol MODBUS - protocol data unit
ADU	Aplicatie unitate de date MODBUS - application data unit
MBAP	Protocol aplicatie MODBUS - application protocol
RS485	Se refera la comunicare standard pe 2 fire, definita de EIA/TIA-485. (Physical layer)
Ethernet	

1.2 Referinte

1. MODBUS over Serial Line Specification and Implementation Guide V1.02
modbus.org 2006 Dec 20
2. MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1b modbus.org
2006 Dec 28
3. MODBUS Messaging on TCP/IP implementation Guide V1.0b
2006 Oct 34
4. Manual de operare VA 5xx

2 Date tehnice Modbus VA 5xx

2.1 Specificatie VA 5xx MODBUS RTU specification

Tip dispozitiv	Slave
Rate de transfer	1200,2400, 4800, 9600, 19200, 38400 bps
Domeniu adrese dispozitiv	1...247
Interfata electrica	RS485, 2 fire
Protocol	RTU
Functii cod admise	3 registru de citire (read holding register) 16 registru de scriere (write multiple register)
Transmisie radio	Nu
Standard	Modbus pe linie seriala V1.02

2.1 Informatii generale Modbus

Modulul VA 5xx Modbus este conform cu Modbus serial line protocol [Referinta 1].

Printre alte lucruri, aceasta implica un protocol **master-slave** de nivel 2, model OSI. Un dispozitiv Master genereaza comenzi explicite catre unul din dispozitivele Slave si proceseaza raspunsurile primite. Dispozitivele Slave nu vor transmite date fara a primi o cerere de la Master si nu vor comunica cu alte dispozitive Slave.

Modbus este un sistem cu un **singur Master**, ceea ce inseamna ca un singur dispozitiv Master poate fi conectat.

2.1.1 Moduri de transmisie seriala (RTU)

Modulul VA 5xx Modbus suporta numai modurile de transmisie seriala: modul RTU. Modul de transmisie defineste semnificatia bitilor campurilor mesajelor transmise serial pe magistrala de date. El stabileste modalitatea in care datele sunt impachetate in campul mesajelor si decodate.

Modul de transmisie si parametrii portului serial trebuie sa fie aceiasi pentru toate dispozitivele conectate pe magistrala MODBUS.

Structura aplicatiei **MODBUS RTU** Application Data Unit (ADU) este aratata mai jos si este valabila atat pentru cerere cat si pentru raspuns.

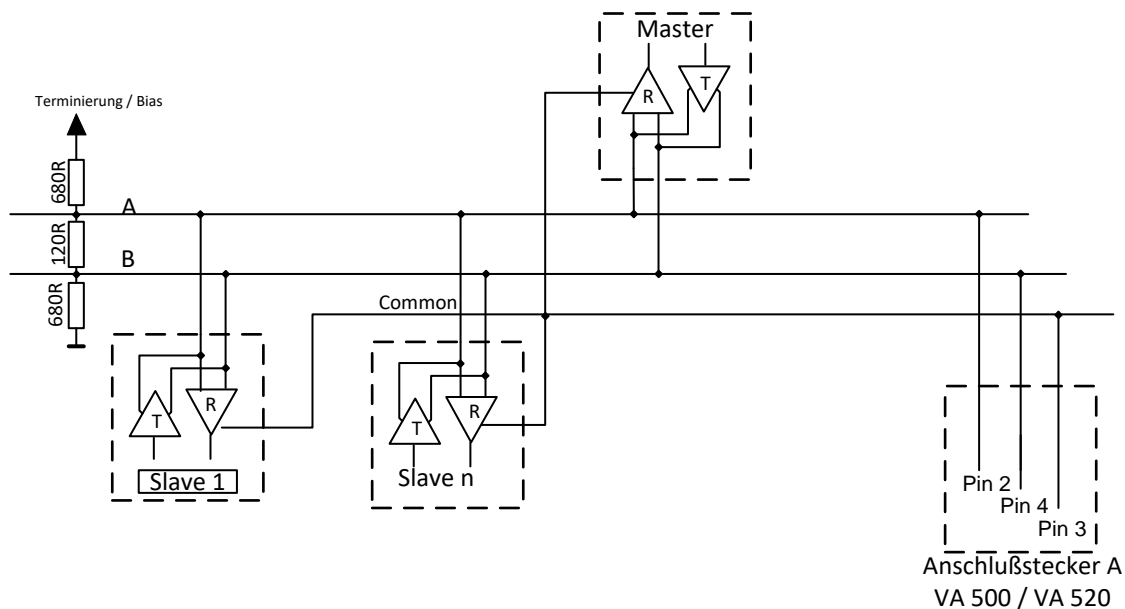
Adresa Slave	Cod functie	Data	CRC
1 byte	1byte	0 up to 252 byte(s)	2 bytes

Tabel 1

Mai multe detalii despre protocolul MODBUS pot fi gasite in Referinta 1 si Referinta 2.

3 Instalare

3.1 Cablare RS485 (Modbus RTU) - VA 500 / VA520



3.1.1 Capat de magistrala VA 500 / VA 520

Nota: In cazul in care senzorul VA 500/VA 520 pentru masurarea debitului este ultimul instrument in retea RS485, atunci este necesara semnalizarea capatului magistralei. Acest lucru se poate face astfel:

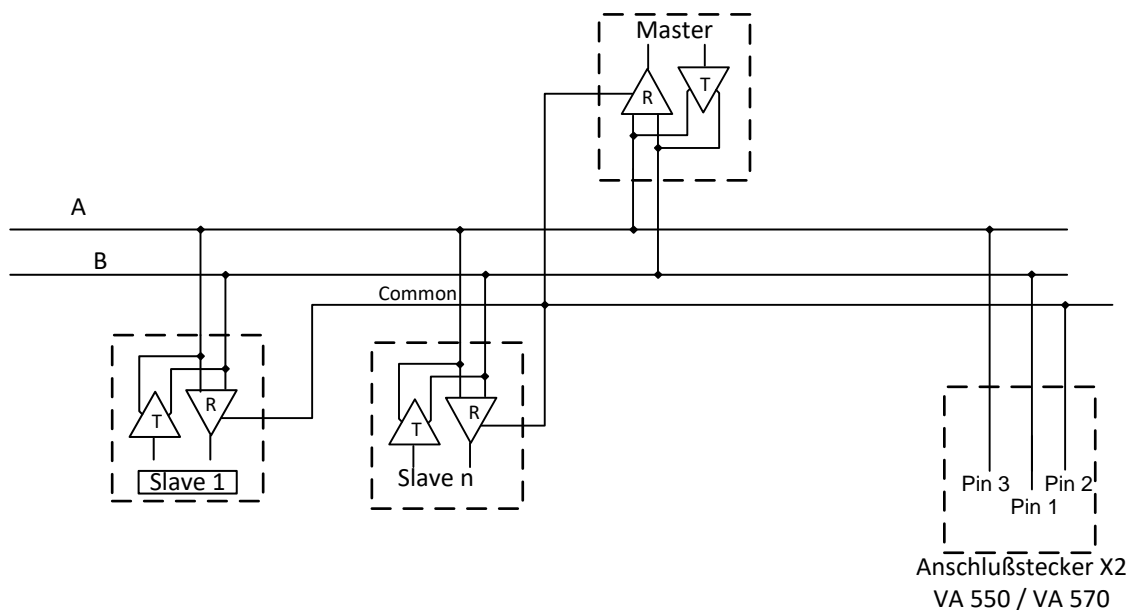
- Pozitionarea corecta a comutatorului intern DIP
- Conectarea unui rezistor de $120\ \Omega$ intre pinii 2 si 4 ai conecturului A

3.1.2 Conflict magistrala (Bias)

Pentru a evita un conflict de magistrala in ceea ce priveste nivelul de prioritate, conectati un rezistor la VCC (Modbus A) si unul la impamantare GND (Modbus B).

Model adresare Modbus

3.2 Cablare RS485 (Modbus RTU) - VA 550 / VA570



3.2.1 Capat de magistrala VA 550 / VA 570

Nota: In cazul in care senzorul VA 550/VA 570 pentru masurarea debitului este ultimul instrument in retea RS485, atunci este necesara conectarea unui rezistor de 120 Ω intre pinii 1 si 3 ai conectorului X2.

3.2.2 Conflict magistrala (Bias)

Pentru a evita un conflict de magistrala in ceea ce priveste nivelului de prioritate, conectati un rezistor la VCC (Modbus A) si unul la impamantare GND (Modbus B).

Cablu magistrala:

Utilizati numai cabluri conform recomandarilor standardului EIA 485. Pe un tronson/segment pot fi conectate maxim 64 dispozitive. Cablul magistralei trebuie asezat la o distanta de cel putin 20 cm fata de alte cabluri. Acesta trebuie amplasat intr-un canal separat si impamantat. Trebuie sa verificati ca nu exista diferenta de potential intre dispozitivele individuale conectate la magistrala.

Caracteristici cablu:

Impedanta:	135 -165 Ohm @ 3 ... 20 Mhz
Capacitate:	< 30pF/m
Diametru:	> 0,64 mm
Sectiune:	> 0,34 mm ² , conform AWG 22
Rezistenta:	< 110 Ohm per km
Ecranare:	Cu tresa metalica sau cu panglica si folie de ecranare

4 Setari comunicatie Modbus RTU

Inainte de comunicarea cu unitatea Master, definiti parametrii baudrate, address si framing.

4.1 Accesare si modificare setari Modbus

Setarile comunicatiei Modbus pot fi modificate din calculator utilizand softul PC service software de la CS Instruments, cu inregistratoarele inteligente DS 400 si DS 500 sau cu instrumentul portabil PI 500.

Nota:

Se recomanda **SA NU** utilizati adresa implicita intr-o retea in care sunt conectate mai multe unitati Slave. Este foarte important sa va asigurati in timpul programarii ca nu aveti doua dispozitive Slave cu aceeasi adresa. In acest caz, pot aparea comportari bizare ale intregii retele seriale, unitatii Master fiindu-i imposibila comunicarea cu toate unitatile Slave din retea.

4.2 Setari comunicatie Modbus RTU

Tip instrument	Slave
Viteza comunicatie	1200,2400, 4800, 9600, 19200, 38400 bps
Domeniu adrese	1...247
Interfata	RS485, 2 fire
Protocol	RTU
Functii cod admise	3 registru de citire (read holding register) 16 registru de scriere (write multiple register)
Transmisie radio	Nu
Standard	Modbus pe linie seriala V1.02

5 Modbus TCP

Comunicatia Modbus necesita stabilirea unei conexiuni TCP intre client (de exemplu: PC) si senzor. Portul TCP 502 rezervat in mod normal pentru Modbus este utilizat pentru comunicatie. Cu toate acestea, utilizatorul poate configura un alt port pentru comunicatie.

Daca este interpus un firewall intre senzor si client, trebuie sa va asigurati ca portul TCP este validat.

6 Model adresare Modbus

Interfata VA 5xx RS485 Modbus permite accesul la citirea/scrierea datelor, in conformitate cu cele descrise in Capitolul 8.

Registrele nedefinite nu pot fi accesate sau nu sunt disponibile.

Format date VA 5xx:

Cuvant simplu

	HByte	LByte
18 =>	00	12
Data Order	1. Byte	2. Byte
	00	12

Cuvant dublu

	HWord		LWord	
	HByte	LByte	HByte	LByte
29235175522 =>	AE	41	56	52
Data Order	1.Byte	2.Byte	3.byte	4.Byte
	AE	41	56	52

Pentru verificarea unei transmisii corecte, cititi registrul 64000 sau 64004.

Rezultatul ar trebui sa fie:

Registrul 64000: Long Integer Valoare =1 000 000

Registrul 64004: Float Valoare = 1 000 000.0

6.1 Functie Cod 3 (Citire registru tampon - Read holding register)

Exceptii generale:

- Cerere mai mica de un registru sau mai mare de 125 registre => Exceptia 3 (Valori date ilegale - Illegal data value)
- Cerere mai mare decat dimensiunea maxima a unui mesaj (27 registre) => Exceptia 2 (Adresa date ilegala - Illegal data address)
- Cerere date in afara domeniului registrelor, Capitolul 8 => Exceptia 2 (Adresa date ilegala - Illegal data address)

Exceptii aplicatii:

- Erori aplicatie => Exceptia 4 (Eroare dispozitiv Slave - Slave device error)

Aliniere spatii/registru - Holes/register alignment:

- Comanda de citire returneaza date in cazul in care nu este indicata o exceptie. O aliniere necorespunzatoare Start/End va determina citirea numai a unei parti a datelor.

6.2 Functie Cod 16 (Scriere registri multipli - Write multiple registers)

In general se pot scrie numai registrele de stare (registrele 2001 – 2064).

Exceptii generale:

- Scriere mai mica de un registru sau mai mare de 63 registre => Exceptia 3 (Valori date ilegale - Illegal data value)
- Daca ByteCount nu este exact dublul numarului de registre => Exceptia 3 (Valori date ilegale - Illegal data value)
- Depasirea lungimii maxime a unui mesaj (27 registre) => Exceptia 2 (Adresa date ilegala - Illegal data address)
- Scrierea datei in afara domeniului registrului, Capitolul 8 => Exceptia 2 (Adresa date ilegala - Illegal data address)

Exceptii aplicatii:

- Erori aplicatie => Exceptia 4 (Eroare dispozitiv Slave - Slave device error)
- Erori aplicatie care include scriere in registre ReadOnly

Aliniere spatii/registru - Holes/register alignment:

- Daca adresa de start nu este adresa unui registru de mapare (mapped holding register) => Exceptia 2 (Adresa date ilegala - Illegal data address)
- Scrierea in spatii este permisa (este ignoratasi nu apare nicio exceptie) — exceptie de la conditiile descrise mai sus.

Setari registre Modbus RTU

7 Registru tampon Modbus - Holding register

7.1 Registru valori de baza - Basic Values Register (1...1000)

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
1	0	4	UInt32	Serial Number	0	R	
3	2	4	UInt32	Software Version	0	R	<code>sprintf(str,"%u.%02u",hw>>16, hw&0xffff);</code>
5	4	4	UInt32	Hardware Version	0	R	<code>sprintf(str,"%u.%02u",hw>>16, hw&0xffff);</code>
7	6	4	UInt32		0	R	
9	8	4	UInt32	Production Date	0	R	Unix Time
11	10	4	UInt32	Calibration Date	0	R	Unix Time
13	12	4	UInt32	Ordering Number	0	R	
15	14	4	UInt32	RunTime	0	R	Value in seconds
17	16	4	UInt32		0	R	
19	18	4	UInt32	Atex Number	0	R	
21	20	4	UInt32	Curve Version	0	R	<code>sprintf(str,"%u.%02u",hw>>16, hw&0xffff);</code>
23	22	8	String	Brand Name	0	R	
27	26	4	UInt32	LockSettings	0	R	0 = NoLock, 1 = DiameterLock, 2 = CounterLock, 3 = RefConditionsLock
29	28	4	UInt32	OptionBoard	0	R	0 = no option 1 = 4-20mA 2 = Ethernet 3 = Mbus 4 = ProfiBus
31	30	4	Dword	Variant	x	R	
33	32	8	String	Company Name	x	R	
37	36	4	Dword	OptionBoard HardwareVersion (if available)	x	R	<code>sprintf(str,"%u.%02u",hw>>16, hw&0xffff);</code>
39	38	4	Dword	OptionBoard SoftwareVersion (falls verfügbar)	x	R	<code>sprintf(str,"%u.%02u",hw>>16, hw&0xffff);</code>

Setari registre Modbus RTU

7.2 Regstru valori - Values register (1001...1500)

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
1001	1000	4	Float	Flow as showed in Display		R	
1003	1002	4	UInt32	Total Counter bevore comma as showed in Display		R	
1005	1004	4	Float	Total Counter after comma as showed in Display		R	
1007	1006	4	Float	Velocity as showed in Display		R	
1009	1008	4	Float	Gas Temperature as shoed in Display		R	
1011	1010	4	Float	Internal Temperature as showed in Display		R	
1013	1012	4	Float	Supply Voltage		R	
1015	1014	4	Float	Max Speed (at Velocity Unit as showed in Display)		R	
1017	1016	4	Float	Max Flow (at Flow Unit as showed in Display)		R	
1019	1018	4	Float	Status of Sensor		R	noError 0x0000 NotCalibrated 0x0001 LowVoltage 0x0002 TempError 0x0004 HeatError 0x0008 IntError 0x000a HeatNotCal 0x0020 AmbNotCal 0x0040 TmpOutofRange 0x0080 Direction 0x0100
1021	1020	4	Float	Flow Min at Flow Unit in Display since Clear Min/Max		R	
1023	1022	4	Float	Flow Max at Flow Unit in Display since Clear Min/Max		R	
1025	1024	4	Float	Flow AV at Flow Unit in Display		R	AV over the Time from AV Time Setup 1 to 1440 minutes
1027	1026	4	Float	Average Consumpton at Consumption Unit in Display		R	Consumption over Time at AVTime Setup
1029	1028	4	Float	Gas Temp Min at Temp. Unit in Display since Clear Min/Max		R	
1031	1030	4	Float	Gas Temp Max at Temp. Unit in Display since Clear Min/Max		R	
1033	1032	4	Float	Gas Temp AV at Temp. Unit in Display		R	AV over the Time from AVTime Setup 1 to 1440 minutes
1035	1034	4	Float	Velocity Min at Velocity Unit in Display since Clear Min/Max		R	
1037	1036	4	Float	Velocity Max at Velocity Unit in Display since Clear Min/Max		R	
1039	1038	4	Float	Velocity AV at Velocity Unit in Display		R	AV over the Time from AVTime Setup 1 to 1440 minutes

Setari registre Modbus RTU

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
1041	1040	4	Float/Dword	Incremented Pulses since setup pulse	x	R	
1043	1042	4	Float/Dword	Systempressure (at Pressure Unit showed in Display)	x	R	Value only available with pressure option
1045	1044	4	Float/Dword	Systempressure Min at Pressure Unit in Display since Clear Min/Max	x	R	Value only available with pressure option
1047	1046	4	Float/Dword	Systempressure Max at Pressure Unit in Display since Clear Min/Max	x	R	Value only available with pressure option
1049	1048	4	Uint/Dword	Total Counter bevore comma as showed in Display (left side)	x	R	only available in Direction Sensor Vaxxxx
1051	1050	4	Float/Dword	Total Counter after comma as showed in Display (left side)	x	R	only available in Direction Sensor Vaxxxx
1053	1052	4	Uint/Dword	Total Counter bevore comma as showed in Display (left side + right side)	x	R	only available in Direction Sensor Vaxxxx
1055	1054	4	Float/Dword	Total Counter after comma as showed in Display (left side + right side)	x	R	only available in Direction Sensor Vaxxxx
1057	1056	4	Float/Dword	reserved	x	R	
to							
1099	1078	4	Float/Dword	reserved	x	R	

Setari registre Modbus RTU

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
1101	1100	4	Float	Flow in m³/h		R	
1103	1102	4	Float	Flow Min in m ³ /h since last Clear Min/Max		R	
1105	1104	4	Float	Flow Max in m ³ /h since last Clear Min/Max		R	
1107	1106	4	Float	Flow AV in m ³ /h		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1109	1108	4	Float	Flow in Nm³/h		R	
1111	1110	4	Float	Flow Min in Nm ³ /h since last Clear Min/Max		R	
1113	1112	4	Float	Flow Max in Nm ³ /h since last Clear Min/Max		R	
1115	1114	4	Float	Flow AV in Nm ³ /h		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1117	1116	4	Float	Flow in m³/min		R	
1119	1118	4	Float	Flow Min in m ³ /min since last Clear Min/Max		R	
1121	1120	4	Float	Flow Max in m ³ /min since last Clear Min/Max		R	
1123	1122	4	Float	Flow AV in m ³ /min		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1125	1124	4	Float	Flow in Nm³/min		R	
1127	1126	4	Float	Flow Min in Nm ³ /min since last Clear Min/Max		R	
1129	1128	4	Float	Flow Max in Nm ³ /min since last Clear Min/Max		R	
1131	1130	4	Float	Flow AV in Nm ³ /min		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1133	1132	4	Float	Flow in ltr/h		R	
1135	1134	4	Float	Flow Min in ltr/h since last Clear Min/Max		R	
1137	1136	4	Float	Flow Max in ltr/h since last Clear Min/Max		R	
1139	1138	4	Float	Flow AV in ltr/h		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“

Setari registre Modbus RTU

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
1141	1140	4	Float	Flow in Nltr/h		R	
1143	1142	4	Float	Flow Min in Nltr/h since last Clear Min/Max		R	
1145	1144	4	Float	Flow Max in Nltr/h since last Clear Min/Max		R	
1147	1146	4	Float	Flow AV in Nltr/h		R	AV over the Time from AVTime Setup 1 to 1440 minutes
1149	1148	4	Float	Flow in ltr/min		R	
1151	1150	4	Float	Flow Min in ltr/min since last Clear Min/Max		R	
1153	1152	4	Float	Flow Max in ltr/min since last Clear Min/Max		R	
1155	1154	4	Float	Flow AV in ltr/min		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1157	1156	4	Float	Flow in Nltr/min		R	
1159	1158	4	Float	Flow Min in Nltr/min since last Clear Min/Max		R	
1161	1160	4	Float	Flow Max in Nltr/min since last Clear Min/Max		R	
1163	1162	4	Float	Flow AV in Nltr/min		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1165	1164	4	Float	Flow in ltr/s		R	
1167	1166	4	Float	Flow Min in ltr/s since last Clear Min/Max		R	
1169	1168	4	Float	Flow Max in ltr/s since last Clear Min/Max		R	
1171	1170	4	Float	Flow AV in ltr/s		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1173	1172	4	Float	Flow in Nltr/s		R	
1175	1174	4	Float	Flow Min in Nltr/s since last Clear Min/Max		R	
1177	1176	4	Float	Flow Max in Nltr/s since last Clear Min/Max		R	
1179	1178	4	Float	Flow AV in Nltr/s		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1181	1180	4	Float	Flow in cfm		R	
1183	1182	4	Float	Flow Min in cfm since last Clear Min/Max		R	
1185	1184	4	Float	Flow Max in cfm since last Clear Min/Max		R	
1187	1186	4	Float	Flow AV in cfm		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“

Setari registre Modbus RTU

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
1189	1188	4	Float	Flow in Ncfm		R	
1191	1190	4	Float	Flow Min in Ncfm since last Clear Min/Max		R	
1193	1192	4	Float	Flow Max in Ncfm since last Clear Min/Max		R	
1195	1194	4	Float	Flow AV in Ncfm		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1197	1196	4	Float	Flow in kg/h		R	
1199	1198	4	Float	Flow Min in kg/h since last Clear Min/Max		R	
1201	1200	4	Float	Flow Max in kg/h since last Clear Min/Max		R	
1203	1202	4	Float	Flow AV in kg/h		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1205	1204	4	Float	Flow in kg/min		R	
1207	1206	4	Float	Flow Min in kg/min since last Clear Min/Max		R	
1209	1208	4	Float	Flow Max in kg/min since last Clear Min/Max		R	
1211	1210	4	Float	Flow AV in kg/min		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1213	1212	4	Float	Flow in kg/s		R	
1215	1214	4	Float	Flow Min in kg/s since last Clear Min/Max		R	
1217	1216	4	Float	Flow Max in kg/s since last Clear Min/Max		R	
1219	1218	4	Float	Flow AV in kg/s		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1221	1220	4	Float	Flow in kW		R	
1223	1222	4	Float	Flow Min in kW since last Clear Min/Max		R	
1225	1224	4	Float	Flow Max in kW since last Clear Min/Max		R	
1227	1226	4	Float	Flow AV in kW		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“

Setari registre Modbus RTU

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
1269	1268	4	UInt32	Consumption m³ before comma	x	R	
1271	1270	4	Float	Consumption m ² after comma	x	R	
1273	1272	4	Float	Consumption m ³ AV	x	R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1275	1274	4	UInt32	Consumption Nm³ before comma	x	R	
1277	1276	4	Float	Consumption Nm ³ after comma	x	R	
1279	1278	4	Float	Consumption Nm ³ AV	x	R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1281	1280	4	UInt32	Consumption ltr before comma	x	R	
1283	1282	4	Float	Consumption ltr after comma	x	R	
1285	1284	4	Float	Consumption ltr AV	x	R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1287	1286	4	UInt32	Consumption Nltr before comma	x	R	
1289	1288	4	Float	Consumption Nltr after comma	x	R	
1291	1290	4	Float	Consumption Nltr AV	x	R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1293	1292	4	UInt32	Consumption cf before comma	x	R	
1295	1294	4	Float	Consumption cf after comma	x	R	
1297	1296	4	Float	Consumption cf AV	x	R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1299	1298	4	UInt32	Consumption Ncf before comma	x	R	
1301	1300	4	Float	Consumption Ncf after comma	x	R	
1303	1302	4	Float	Consumption Ncf AV	x	R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1305	1304	4	UInt32	Consumption kg before comma	x	R	
1307	1306	4	Float	Consumption kg after comma	x	R	
1309	1308	4	Float	Consumption kg AV	x	R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1311	1310	4	UInt32	Consumption kWh before comma	x	R	
1313	1312	4	Float	Consumption kWh after comma	x	R	
1315	1314	4	Float	Consumption kWh AV	x	R	Average for time period defined in AVTime Setup „1 to 1440 minutes“

Setari registre Modbus RTU

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
1347	1346	4	Float	Velocity m/s		R	
1349	1348	4	Float	Velocity Min m/s since last Clear Min/Max		R	
1351	1350	4	Float	Velocity Max m/s since last Clear Min/Max		R	
1353	1352	4	Float	Velocity AV m/s		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1355	1354	4	Float	Velocity Nm/s		R	
1357	1356	4	Float	Velocity Min Nm/s since last Clear Min/Max		R	
1359	1358	4	Float	Velocity Max Nm/s since last Clear Min/Max		R	
1361	1360	4	Float	Velocity AV Nm/s		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1363	1362	4	Float	Velocity Ft/min		R	
1365	1364	4	Float	Velocity Min Ft/min since last Clear Min/Max		R	
1367	1366	4	Float	Velocity Max Ft/min since last Clear Min/Max		R	
1369	1368	4	Float	Velocity AV Ft/min		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1371	1370	4	Float	Velocity NFt/min		R	
1373	1372	4	Float	Velocity Min NFt/min since last Clear Min/Max		R	
1375	1374	4	Float	Velocity Max NFt/min since last Clear Min/Max		R	
1377	1376	4	Float	Velocity AV NFt/min		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1419	1418	4	Float	GasTemp °C		R	
1421	1420	4	Float	GasTemp Min °C since Clear Min/Max		R	
1423	1422	4	Float	GasTemp Max °C since Clear Min/Max		R	
1425	1424	4	Float	GasTemp AV °C		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“
1427	1426	4	Float	GasTemp °F		R	
1429	1428	4	Float	GasTemp Min °F since Clear Min/Max		R	
1431	1430	4	Float	GasTemp Max °F since Clear Min/Max		R	
1433	1432	4	Float	GasTemp AV °F		R	Average for time period defined in AVTime Setup „1 to 1440 minutes“

Setari registre Modbus RTU

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
1475	1474	4	Float	Systempressure mbar	x	R	Value only available with pressure option
1477	1476	4	Float	systempressure Min mbar since Clear Min/Max	x	R	Value only available with pressure option
1479	1478	4	Float	systempressure Max mbar since Clear Min/Max	x	R	Value only available with pressure option
1481	1480	4	Float	Systempressure bar	x	R	Value only available with pressure option
1483	1482	4	Float	systempressure Min bar since Clear Min/Max	x	R	Value only available with pressure option
1485	1484	4	Float	systempressure Max bar since Clear Min/Max	x	R	Value only available with pressure option
1487	1486	4	Float	Systempressure psi	x	R	Value only available with pressure option
1489	1488	4	Float	systempressure Min psi since Clear Min/Max	x	R	Value only available with pressure option
1491	1490	4	Float	systempressure Max psi since Clear Min/Max	x	R	Value only available with pressure option

Setari registre Modbus RTU

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
1533	1532	4	UInt	Consumption m ³ bevore comma (left side)	x	R	only available in Direction Sensor VA 509
1535	1534	4	Float	Consumption m ² after comma (left side)	x	R	
1537	1536	4	UInt	Consumption total m ³ bevore comma (left side + right side)	x	R	
1539	1538	4	Float	Consumption total m ² after comma (left side + right side)	x	R	
1541	1540	4	UInt	Consumption Nm ³ bevore comma (left side)	x	R	
1543	1542	4	Float	Consumption Nm ² after comma (left side)	x	R	
1545	1544	4	UInt	Consumption total Nm ³ bevore comma (left side + right side)	x	R	
1547	1546	4	Float	Consumption total Nm ² after comma (left side + right side)	x	R	
1549	1548	4	UInt	Consumption ltr bevore comma (left side)	x	R	
1551	1550	4	Float	Consumption ltr after comma (left side)	x	R	
1553	1552	4	UInt	Consumption total ltr bevore comma (left side + right side)	x	R	
1555	1554	4	Float	Consumption total ltr after comma (left side + right side)	x	R	
1557	1556	4	UInt	Consumption Nltr bevore comma (left side)	x	R	
1559	1558	4	Float/	Consumption Nltr after comma (left side)	x	R	
1561	1560	4	UInt	Consumption total Nltr bevore comma (left side + right side)	x	R	
1563	1562	4	Float	Consumption total Nltr after comma (left side + right side)	x	R	
1565	1564	4	UInt	Consumption Cf bevore comma (left side)	x	R	
1567	1566	4	Floatd	Consumption Cf after comma (left side)	x	R	
1569	1568	4	UInt	Consumption total Cf bevore comma (left side + right side)	x	R	
1571	1570	4	Float	Consumption total Cf after comma (left side + right side)	x	R	
1573	1572	4	UInt	Consumption NCf bevore comma (left side)	x	R	
1575	1574	4	Float	Consumption NCf after comma (left side)	x	R	
1577	1576	4	UInt	Consumption total NCf bevore comma (left side + right side)	x	R	

Setari registre Modbus RTU

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
1579	1578	4	Float/Dword	Consumption total NCf after comma (left side + right side)	x	R	only available in Direction Sensor VA 509
1581	1580	4	UInt/Dword	Consumption kg bevore comma (left side)	x	R	
1583	1582	4	Float/Dword	Consumption kg after comma (left side)	x	R	
1585	1584	4	UInt/Dword	Consumption total kg bevore comma (left side + right side)	x	R	
1587	1586	4	Float/Dword	Consumption total kg after comma (left side + right side)	x	R	
1589	1588	4	UInt/Dword	Consumption kWh bevore comma (left side)	x	R	
1591	1590	4	Float/Dword	Consumption kWh after comma (left side)	x	R	
1593	1592	4	UInt/Dword	Consumption total kWh bevore comma (left side + right side)	x	R	
1595	1594	4	Float/Dword	Consumption total kWh after comma (left side + right side)	x	R	

Setari registre Modbus RTU

7.3 Setari registre (Device settings register)

7.3.1 Setari Modbus - Modbus Settings (2001...2005)

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
2001	2000	2	UInt16	Modbus ID	1	R/W	Modbus ID 1...247
2002	2001	2	UInt16	Baudrate	4	R/W	0 = 1200 1 = 2400 2 = 4800 3 = 9600 4 = 19200 5 = 38400
2003	2002	2	UInt16	Parity	1	R/W	0 = none 1 = even 2 = odd
2004	2003	2	UInt16	Number of Stopbits		R/W	0 = 1 Stop Bit 1 = 2 Stop Bit
2005	2004	2	UInt16	Word Order	0xABCD	R/W	0xABCD = Big Endian 0xCDAB = Middle Endian

7.3.2 Setari afisaj - Display Settings (2007...2009)

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
2007	2006	2	UInt16	Rotate Display(only VA550 / VA570)	0	R/W	0 = 0° 1 = 180°
2008	2007	2	UInt16	BackLight Brightness	80	R/W	30 to 100%
2009	2008	2	UInt16	Language	0	R/W	0 = English (at the moment only English supported)

Setari registre Modbus RTU

7.3.3 Setari instrument - Device Settings (2021...2063)

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
2021	2020	16	String	Sensor Location	""	R/W	
2029	2028	4	UInt32	Calibrated GasType as index	0	R/W	index to Get Gas Names as String at adr. 14000
2031	2030	4	UInt32	GasSubType (only available if Calibrated GasType is Air)	0	R/W	0 = Air 1 = CO2 2 = N2O 3 = N2 4 = O2 5 = NG 6 = AR 7 = He 8 = H2 9 = C3H8 10 = CH4
2033	2032	4	UInt32	Unit Length as index to Unit Table	64 (mm)	R/W	
2035	2034	4	UInt32	Unit Flow as index to Unit Table	14 (m ³ /h)	R/W	
2037	2036	4	UInt32	Unit Velocity as index to Unit Table	10 (m/s)	R/W	
2039	2038	4	UInt32	Unit Consumption as index to Unit Table	24 (m ³)	R/W	
2041	2040	4	UInt32	Unit Temperature as index to Unit Table	1 (°C)	R/W	
2043	2042	4	UInt32	Unit Pressure as index to Unit Table	38 (mbar)	R/W	
2045	2044	4	Float	Diameter at the Unit programmed above	order	R/W	
2047	2046	4	Float	Reference Temperature in Unit programmed above	20	R/W	
2049	2048	4	Float	Reference Pressure in Unit programmed above	1000	R/W	
2051	2050	4	Float	System Pressure in Unit programmed above	5000	R/W	
2053	2052	4	Float	Zero Point of Velocity in Unit programmed above	0	R/W	
2055	2054	4	Float	Min Velocity in Unit programmed above	0	R/W	
2057	2056	4	Float	LowPass Filter Time for Flow and Velocity in ms	100	R/W	
2059	2058	4	UInt32	Average Time to Build Average (1 to 1440 minutes)	60	R/W	
2061	2060	4	Float	HeatRating for Flammable gases at 0°C / 1013.25mbar	0	R/W	
2063	2062	4	UInt32	next Cal Date	CalDate + 2 Years	R/W	UnixTime

Setari registre Modbus RTU

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
2081	2080	4	Float	Relais Mode as index	1	R/W	0 = none 1 = Puls 2 = Alarm
2083	2082	4	Float	Unit Puls from Unit Table	U_m3	R/W	U_m3 U_ltr U_cf U_kg
2085	2084	4	Float	Pulse Value (value where is generated a new puls)	1	R/W	
2087	2086	4	Float	Pulse Polarity	1	R/W	0 = neg 1 = pos
2089	2088	4	Float	Unit Alarm from Unit Table	U_GRA D_C	R/W	U_m_s U_m3_h U_ltr_s U_cfm U_kg_min U_kg_s U_GRAD_C U_GRAD_F
2091	2090	4	Float	Alarm Value in Unit above	25	R/W	
2093	2092	4	Float	Alarm Hysteresis in Unit above	1	R/W	
2095	2094	4	Float	Alarm at overshoot or undershot as index	1	R/W	0 = undershot 1 = overshoot
2113	2112	4	Float	Reset to Factory Defaults		W	send Serial Number to this adr. to set factory defaults
2115	2114	4	Float	Consumption at programmed unit above		W	if not locked, value to set consumption
2117	2116	4	Float	Reset Min/Max Values		W	
2119	2118	4	Float	Reset AV Values		W	
2121	2120	4	Float	Temperature Correction Value at unit programmed above		R/W	Write the actual measured Temperature value to this register at read the offset to internal temperature is returned
2123	2122	4	Float	Set or Clear RemoteControl State		R/W	0 = cleared all other means remote controlled
2125	2124	4	Float	User offset pressure		R/W	only with pressure option available
2127	2126	4	Float	Consumption (left side) at programmed unit above		R/W	only available in Direction Sensor VA509

Setari registre Modbus RTU

7.3.4 Setari scalare iesire analogica 4...20 mA - Analog Scaling Settings

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
2201	2200	4	UInt32	4-20mA CH1 Selected Value as index	1 or 2	R/W	0 = not used 1 = Flow 2 = Velocity 3 = Temperature
2203	2202	4	UInt32	4-20mA CH1 Unit index from unit table for above selected Value	U_m3_h U_m_s	R/W	Flow: U_m3_h,U_Nm3_h,U_m3_min,U_Nm3_min,U_ltr_h,U_Nltr_h,U_ltr_min,U_Nl_min,U_ltr_s,U_Nl_s,U_cfm,U_Ncfm,U_kg_h,U_kg_min,U_kg_s,U_kW Velocity: U_m_s,U_Nm_s,U_Ft_min,U_Nft_min Temperature: U_GRAD_C,U_GRAD_F
2205	2204	4	UInt32	4-20mA CH1 Auto or Manual Range	0	R/W	0 = AutoRange 1 = Manual Range
2207	2206	4	UInt32	4-20mA CH1 Scale Low	0	R/W	writabel only if Manual Range is selected
2209	2208	4	UInt32	4-20mA CH1 Scale High	Max Speed	R/W	writabel only if Manual Range is selected
2211	2210	4	UInt32	4-20mA CH2 Selected Value as index	3	R/W	0 = not used 1 = Flow 2 = Velocity 3 = Temperature
2213	2212	4	UInt32	4-20mA CH2 Unit index from unit table for above selected Value	U_GRA D_C	R/W	Flow: U_m3_h,U_Nm3_h,U_m3_min,U_Nm3_min,U_ltr_h,U_Nltr_h,U_ltr_min,U_Nl_min,U_ltr_s,U_Nl_s,U_cfm,U_Ncfm,U_kg_h,U_kg_min,U_kg_s,U_kW Velocity: U_m_s,U_Nm_s,U_Ft_min,U_Nft_min Temperature: U_GRAD_C,U_GRAD_F
2215	2214	4	UInt32	4-20mA CH2 Auto or Manual Range	-20	R/W	0 = AutoRange 1 = Manual Range
2217	2216	4	UInt32	4-20mA CH2 Scale Low	100	R/W	writabel only if Manual Range is selected
2219	2218	4	UInt32	4-20mA CH2 Scale High	Max Speed	R/W	writabel only if Manual Range is selected
2221	2220	4	UInt32	4-20mA CH1 and CH2 Current on error as index		R/W	0 = is the actual value below or above the Scaling 3.8mA or 20.5mA is outputed 1 = 22mA is outputed 2 = 2mA is outputed
2223	2222	4	UInt32	4-20mA number of available channels	1	R	

Setari registre Modbus RTU

7.4 Setari nume gaz – Gasname Settings

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
2501	2500	16	String	Gas at index 0	Air	R	
2509	2508	16	String	Gas at index 1		R	
2517	2516	16	String	Gas at index 2		R	
2525	2524	16	String	Gas at index 3		R	
2533	2532	16	String	Gas at index 4		R	
2541	2540	16	String	Gas at index 5		R	
2549	2548	16	String	Gas at index 6		R	
2557	2556	16	String	Gas at index 7		R	
2565	2564	16	String	Gas at index 8		R	
2573	2572	16	String	Gas at index 9		R	
2581	2580	16	String	Gas at index 10		R	
2589	2588	16	String	Gas at index 11		R	
2597	2596	16	String	Gas at index 12		R	
2605	2604	16	String	Gas at index 13		R	
2613	2612	16	String	Gas at index 14		R	

Adresa registru Gasname: (Valoare Registru 2031)*8 + 2500

Exemplu: Valoare Registru 2031 = 1

Adresa registru Gasname: (1*8) + 2500 = 2508

Setari registre Modbus RTU

7.5 Setari Mbus - Mbus register

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
3001	3000	4	Dword	Mbus Primary Address	0x01	R/W	Range 1..255
3003	3002	4	Dword	Mbus ID	0	R/W	Range 0..99999999
3005	3004	4	Dword	Mbus Medium Index	0x0E	R/W	0x00 = Other 0x01 = Oil 0x02 = Electricity 0x03 = Gas 0x04 = Heat 0x05 = Steam 0x06 = Hot Water 0x07 = Water 0x08 = H.C.A. 0x09 = Compressed Air 0x0A = C.L.M. - in 0x0B = C.L.M. - out 0x0C = Hot Water Mode 2 0x0D = Water Mode 2 0x0E = Bus / System 0x0F = Reserved
3007	3006	4	Dword	Mbus Baudrate Index	0x03	R/W	0x00 = 300 0x01 = 600 0x02 = 1200 0x03 = 2400 0x04 = 4800 0x05 = 9600
3009	3008	4	Dword	Mbus Manufacturer	CSI	R/W	$((\text{CHAR_1} - 64) * 1024) + ((\text{CHAR_2} - 64) * 32) + (\text{CHAR_3} - 64)$
3011	3010	4	Dword	Number of Mbus values	1	R/W	Range 0..20
3013	3012	4	Dword	Index of Value #1	0	R/W	
3015	3014	4	Dword	Unit Index for Value #1	14	R/W	
3017	3016	4	Dword	Index of Value #2		R/W	
3019	3018	4	Dword	Unit Index for Value #2		R/W	
3021	3020	4	Dword	Index of Value #3		R/W	
3023	3022	4	Dword	Unit Index for Value #3		R/W	
3025	3024	4	Dword	Index of Value #4		R/W	
3027	3026	4	Dword	Unit Index for Value #4		R/W	
to							
3089	3038	4	Dword	Index of Value #20		R/W	
3091	3040	4	Dword	Unit Index for Value #20		R/W	

7.6 Format date registru test - Data format test register (64001... 64003)

Registru Modbus	Adresa Modbus	Nr. de Byte	Tip data	Descriere	Setari implicite	Citire Scriere	Comentariu
64001	64000	4	Dword	1000000	x	R	format test for Dword
64003	64002	4	float	1000000.0	x	R	format test for float

Setari registre Modbus RTU

7.7 Setari unitate de masura - Unit Index Table

Index	Valoare	Index	Valoare	Index	Valoare	Index	Valoaree
1	°C	11	fpm	21	Nltr/min	31	atm°C
2	°F	12	Nm/s	22	Nltr/s	32	atm°F
3	%RH	13	SFPM	23	SCFM	33	pa
4	°Ctd	14	m³/h	24	m³	34	hpa
5	°Ftd	15	m³/min	25	ltr	35	kpa
6	mg/kg	16	ltr/min	26	cf	36	Mpa
7	mg/m³	17	ltr/s	27	Nm³	37	mbar
8	g/kg	18	cfm	28	Nltr	38	bar
9	g/m³	19	Nm³/h	29	SCF	39	psi
10	m/s	20	Nm³/min	30	ppm	40	mV

Index	Valoare	Index	Valoare	Index	Valoare	Index	Valoaree
41	V	51	AVcf/h	61	kVAr	71	ltr/h
42	µV	52	kg/h	62	-	72	Nltr/h
43	kV	53	kg/min	63	€	73	lb/h
44	mA	54	Ohm	64	cts/m³	74	lb/min
45	A	55	Hz	65	W	75	lb/s
46	kg/s	56	%	66	Wh	76	t/h
47	kg	57	kW	67	h	77	t
48	AVm³/h	58	kWh	68	dB	78	lb
49	AVl/h	59	PCS	69	mm	79	SCFH
50	AVkg/h	60	kVA	70	inch	80	cfh

Index	Valoare	Index	Valoare	Index	Valoare	Index	Valoaree
81	g/s						
82	g/min						
83	m						
84	ft						

8 Anexa

8.1 Coduri exceptate (Exception codes)

VA 5xx Modbus utilizeaza urmatoarele coduri exceptate atunci cand trimite un raspuns catre Master:

Cod exceptie	Nume exceptie
0x01	Functie ilegala (Illegal function)
0x02	Adresa date ilegala (Illegal data address)
0x03	Valoare date ilegala (Illegal data value)
0x04	Dispozitiv Slave defect (Slave device failure)
0x05	Acceptare (Acknowledge)
0x06	Dispozitiv Slave ocupat (Slave device busy)