Fluid Management Systems & System Integration



Badger Meter



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Fluid Management Systems Portfolio

RF-HE ZigBee®
The flexible system, easy to install



MDS 2000
The wired and networked system



FMS Compact
The rugged design for small workshops



General Topics for Fluid Management Systems

Access control

- PIN code user access
  Only authorized people are getting access to the system



Internal datalogger

- All dispenses are logged with detailed information
- Provides a tailored statistic of fluid consumption



DMS interface

- Direct access to a DMS system can control as well the fluid access and add all the dispenses directly to customer invoice



General Topics for Fluid Management Systems

Topic – No oil loss

- Full control over the oil consumption
- No oil waste due to the traceability of each oil dispense

Topic – Quality management

- System can be used as a quality management tool, because the whole dispense procedure is tracked and visualized.
- System can control:
  - Who is allowed to dispense
  - Which fluids can be used for a certain work order number
  - Defines the quantity who can be dispensed
- This might prevent from a damaged engine due to wrong oil or overfilling.

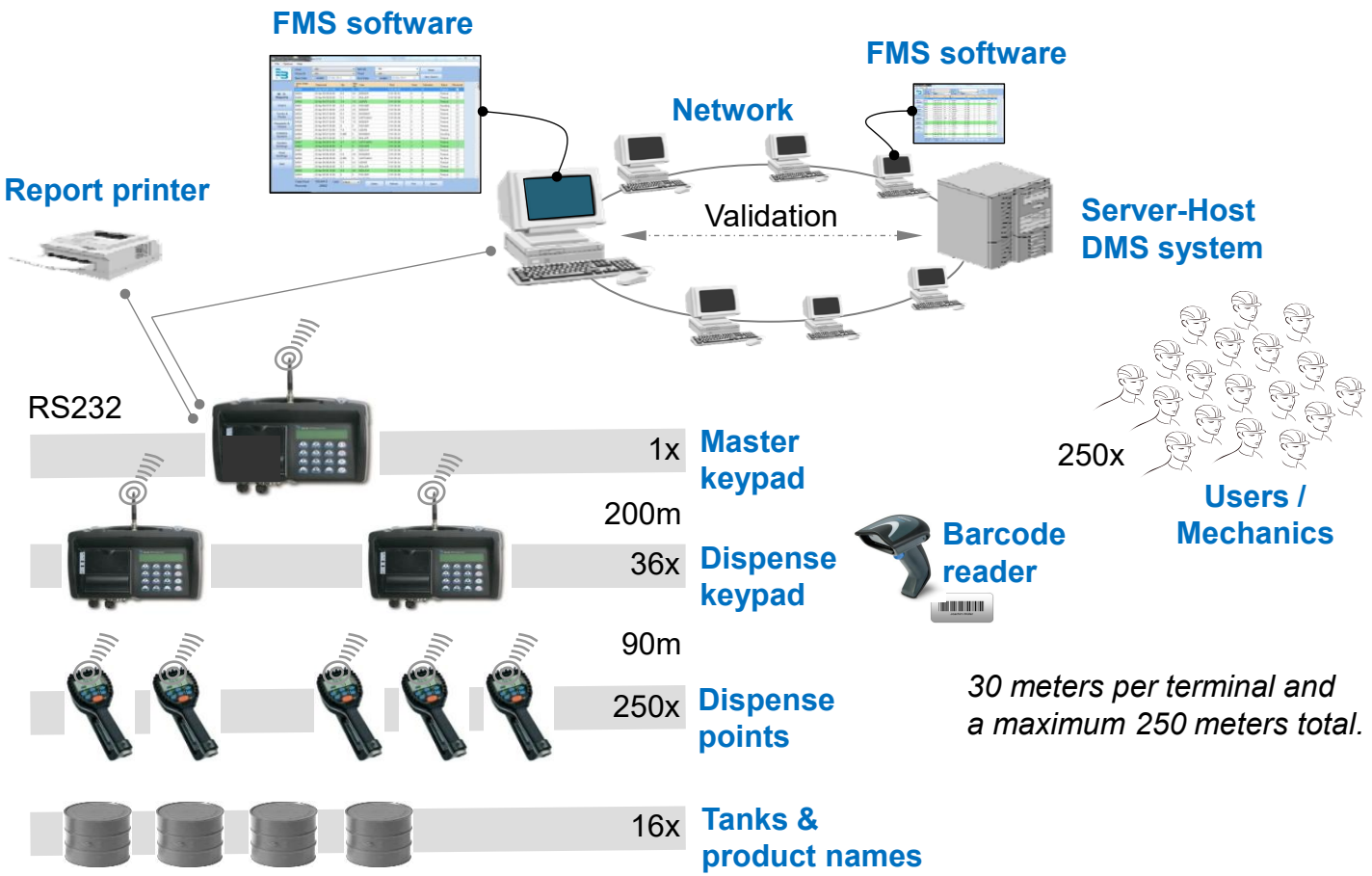






RF System

Overview – RF High-End ZigBee® System



Approvals

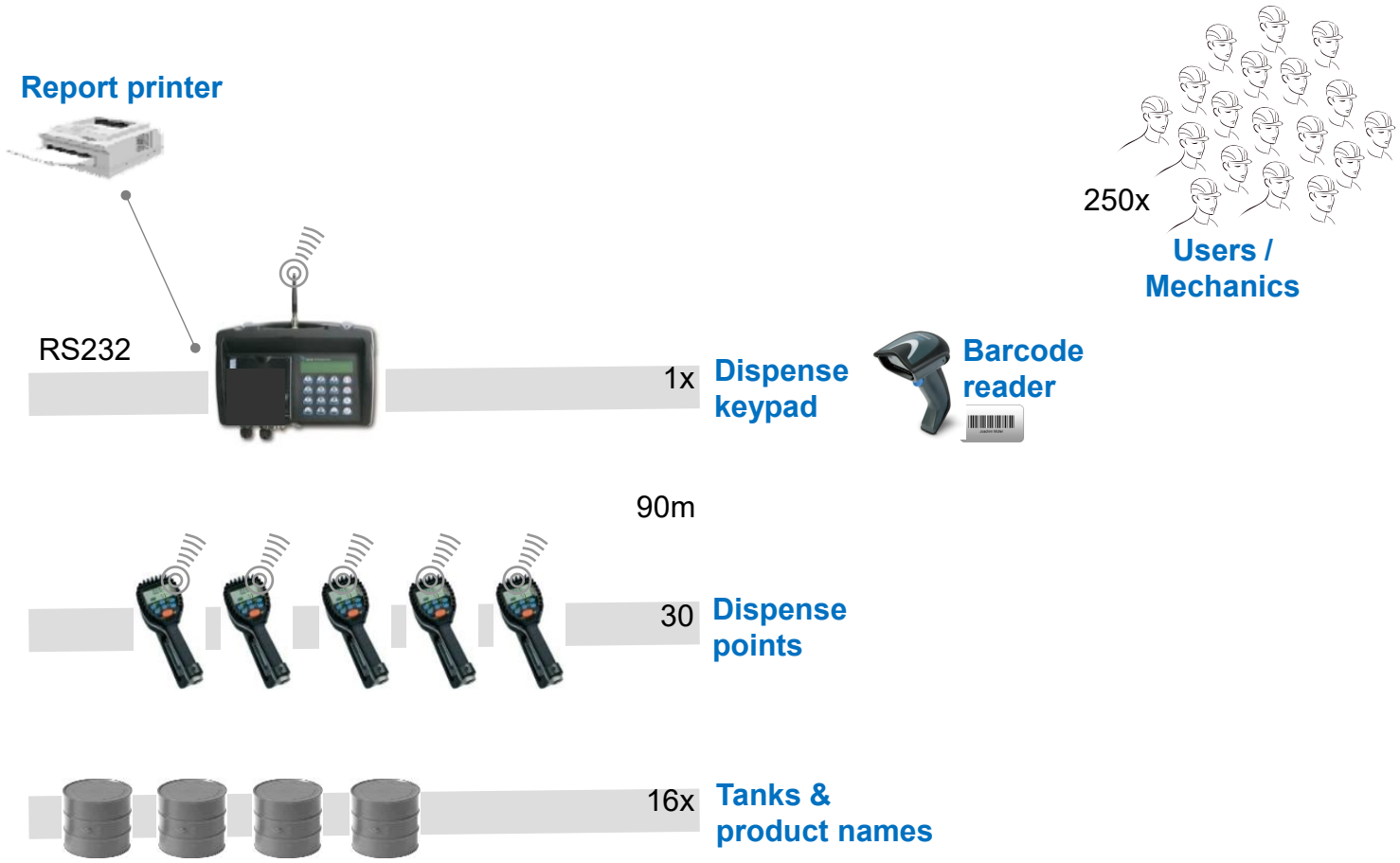
PTB BEV

OIML R117-1
in preparation

Specifications

Keypad:	115 / 230 VAC
Valve & counter:	Integrated in meter, Battery-powered 6VDC 20,000 dispenses
Barcode scanner:	RS232 (dispense keypad)
Transactions:	1200 max. master keypad 40,0000 FMS software
Users:	Max. 250
Protection class:	IP57

Overview – RF Basic ZigBee® System



Approvals

PTB BEV

OIML R117-1
in preparation

Specifications

Keypad:	115 / 230 VAC
Valve & counter:	Integrated in meter, Battery-powered 6VDC 20,000 dispenses
Barcode scanner:	RS232 (dispense keypad)
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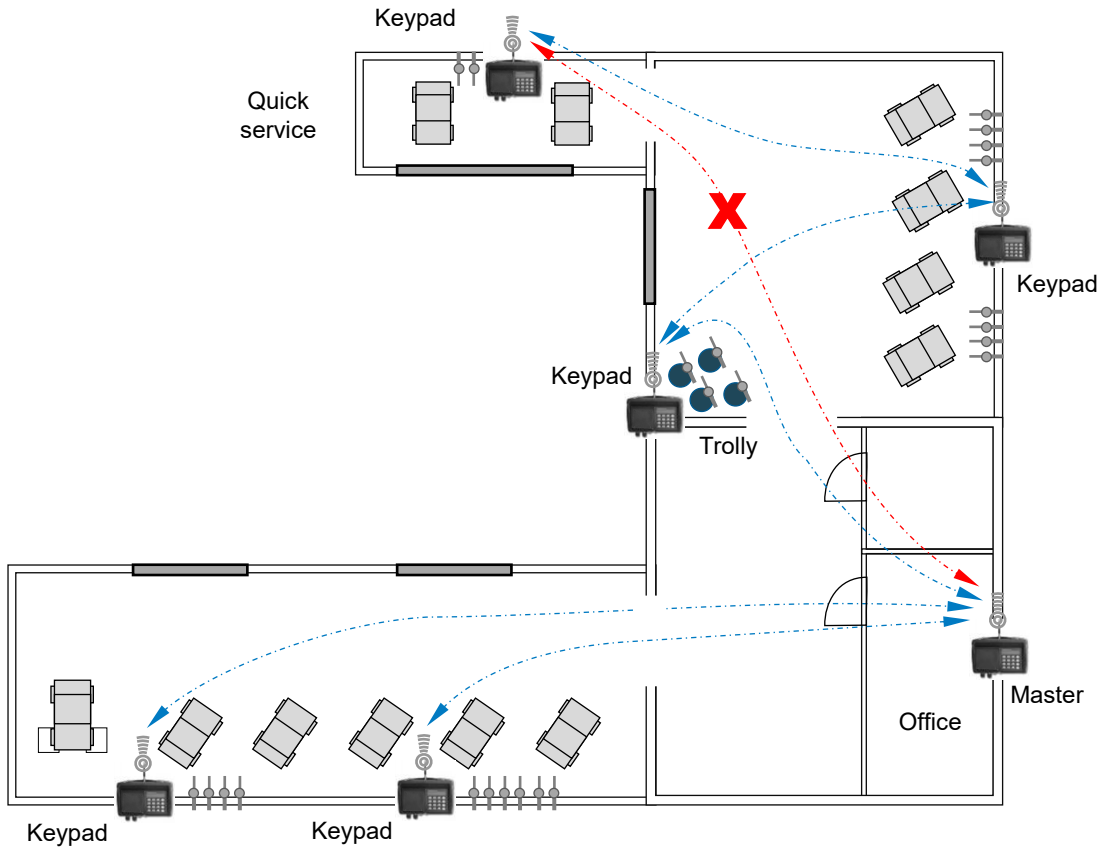
Technical Features of a ZigBee® System

- Worldwide compatibility for ZigBee® radio module
- Range improvement at 20dBm 200m keypad/keypad 90m meter/keypad
- Communication robustness. Mesh network allows for multiple routes between radio nodes. Dynamic link formation allows for meter radios to communicate with nearest keypad in range or allows keypads to develop new routes as obstructions in the environment change (e.g., car or truck on a lift)
- Collision avoidance (CSMA/CA) / carrier sense multiple access to avoid two radios from transmitting at the same time (“listen before talk”)
- Network security 128-bit link key required for joining network.
- Improved communication speed. Data rate 250 kbits/s
  Communication improvement of 2 to 3 times over existing 868MHz radios
- Signal strength: The ZigBee® radio module is using approx.100mW when compared to a mobile phone, which is using up to 2W at a poor radio coverage.

The ZigBee® Daisy Chain Principle

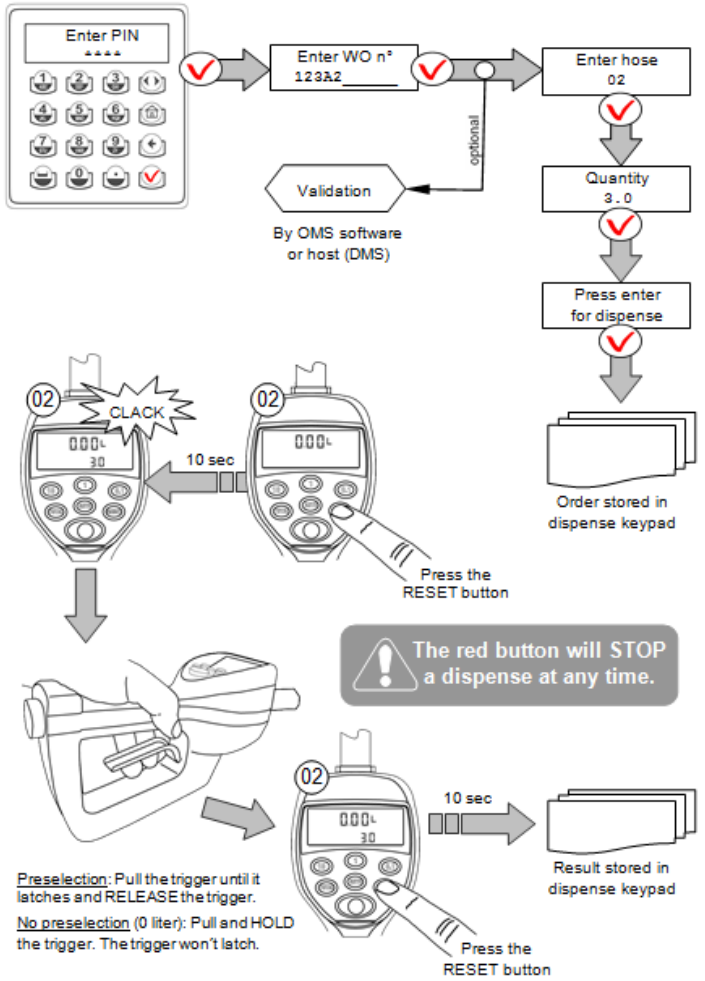
Dynamic routing:

- Each dispense keypad can work as a repeater.
- If the direct communication is interrupted, the data set will automatically search for a new way to reach the master.



Dispense with Barcode Scanner





Dispense with Barcode Scanner



QR-code

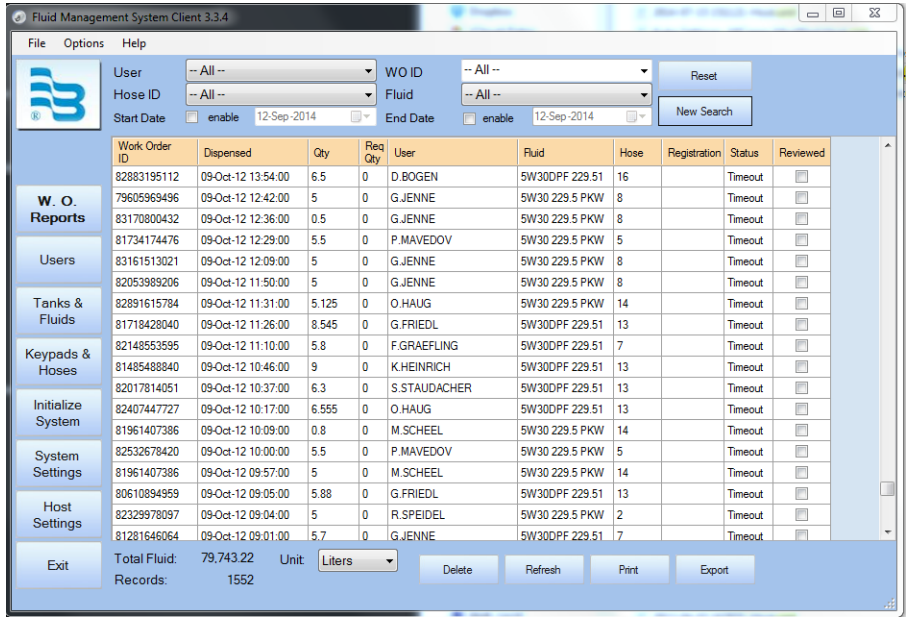
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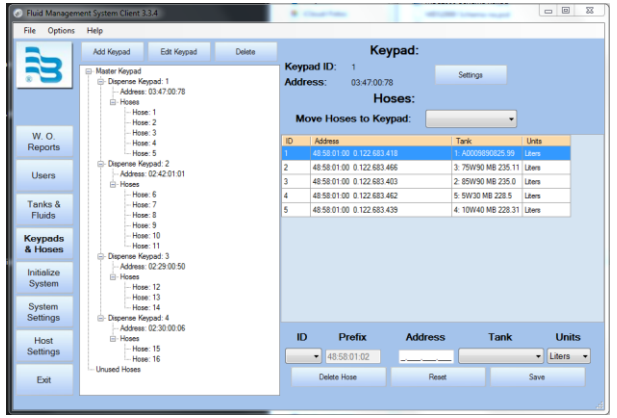
Barcode

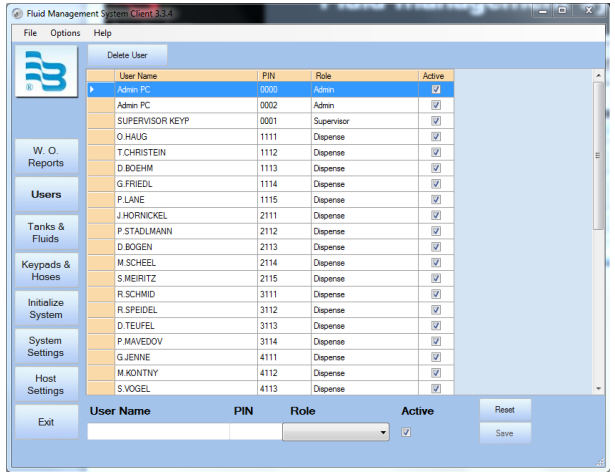


FMS Administration Software

- All dispenses are recorded with detailed information
- Detailed statistics can be made, by oil time frame, etc.
- Three different access levels
- Comfortable system configuration



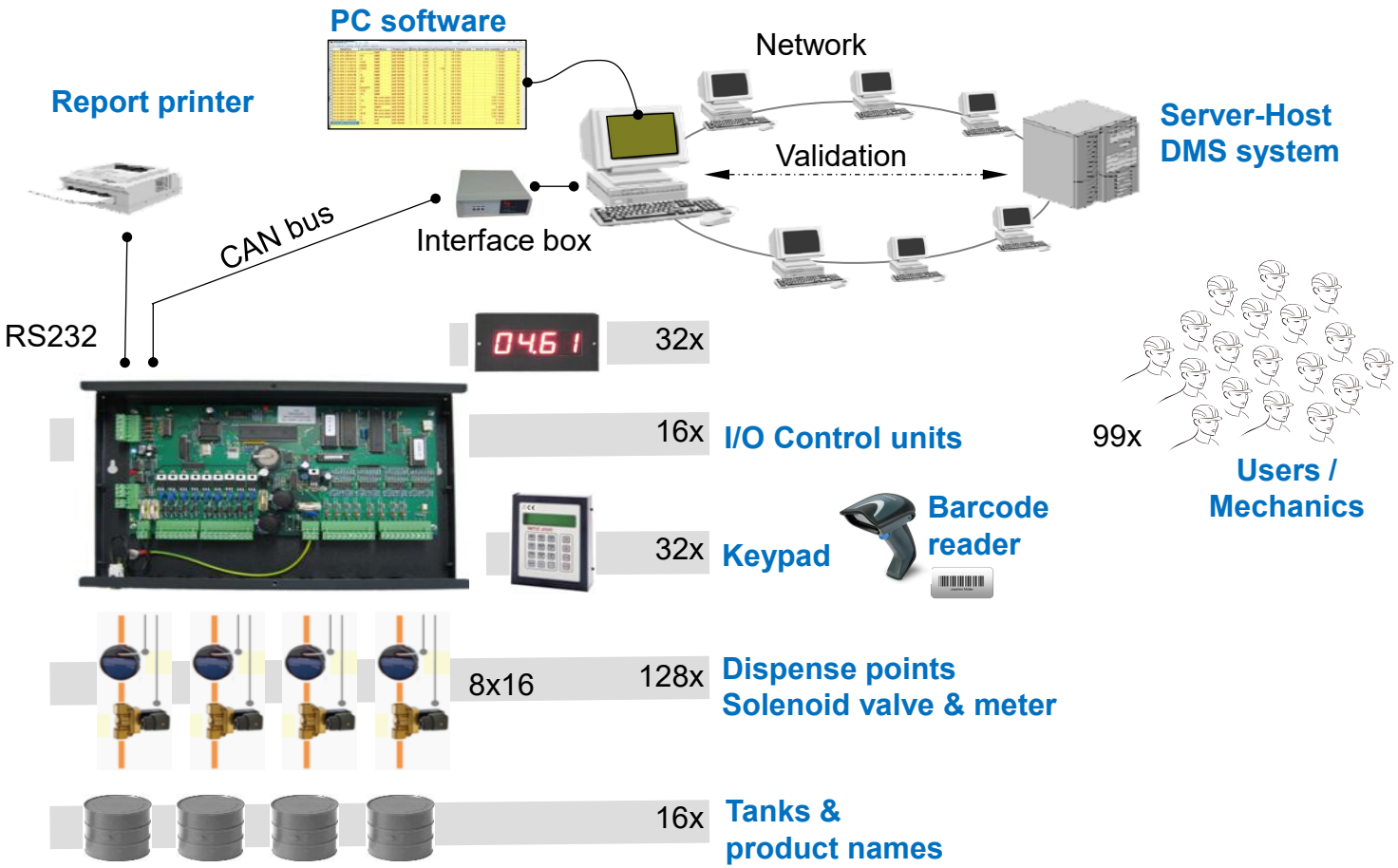




MDS 2000

Badger Meter

Overview – MDS 2000



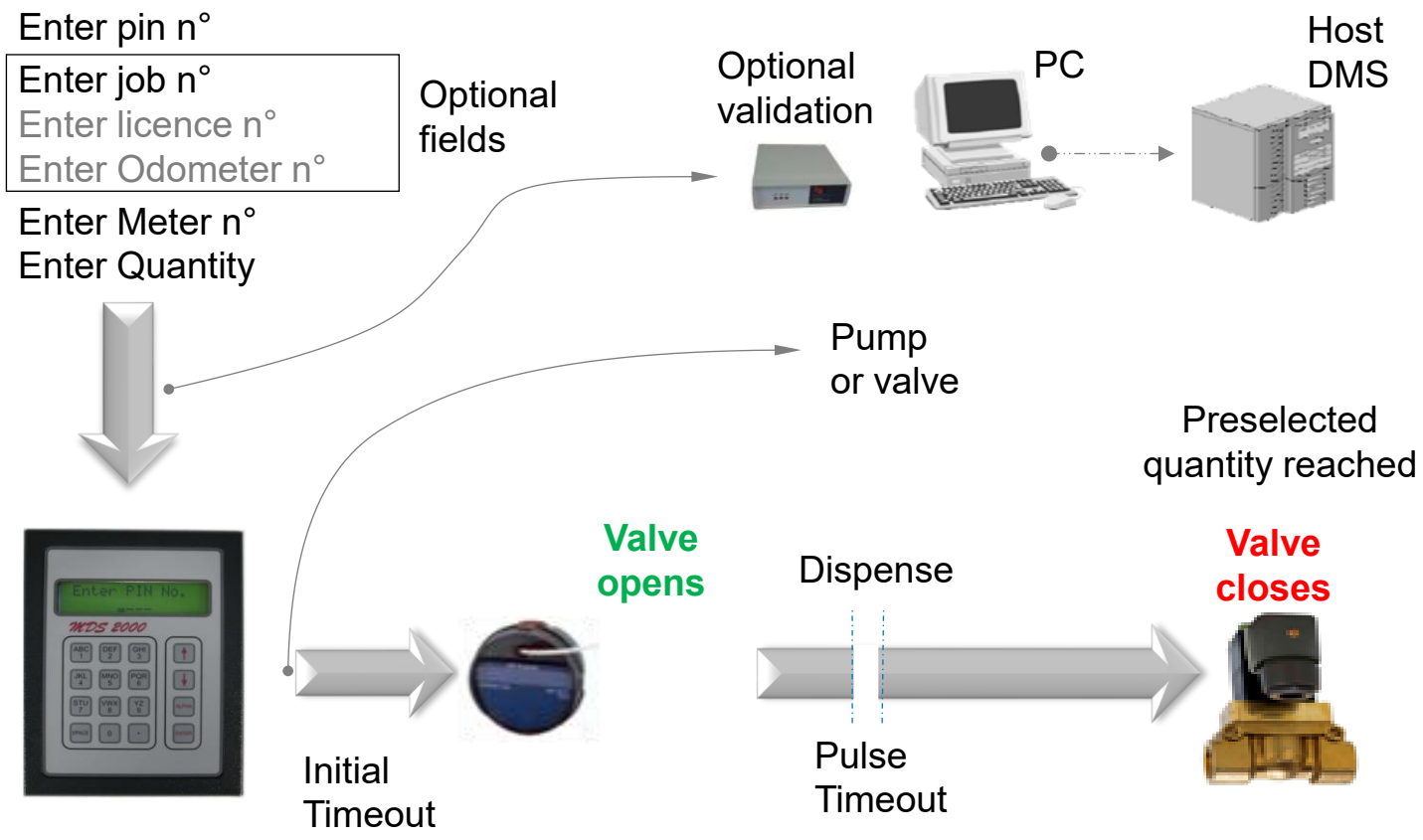
Approvals

PTB BEV

Specifications

Pulse input:	8x NPN opto-isolated, 1-100 PPL
Valve output:	8x 24VDC, max. load 2A
Pump control:	1x 24VDC, max. load 2A
Ticket printer:	RS232 (I/O or keypad)
Barcode scanner:	RS232 (dispense keypad)
Transactions:	Max. 2,999
Users:	Max. 99
Protection class:	IP57

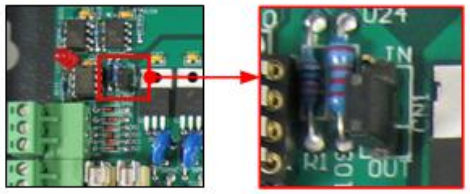
Dispense Procedure



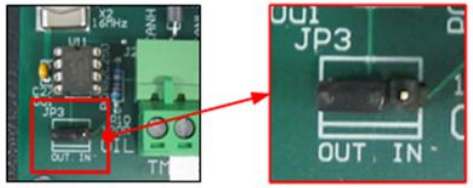
CAN Bus Network



IO Jumper for termination - CN1



Keypad Jumper for termination – JP3



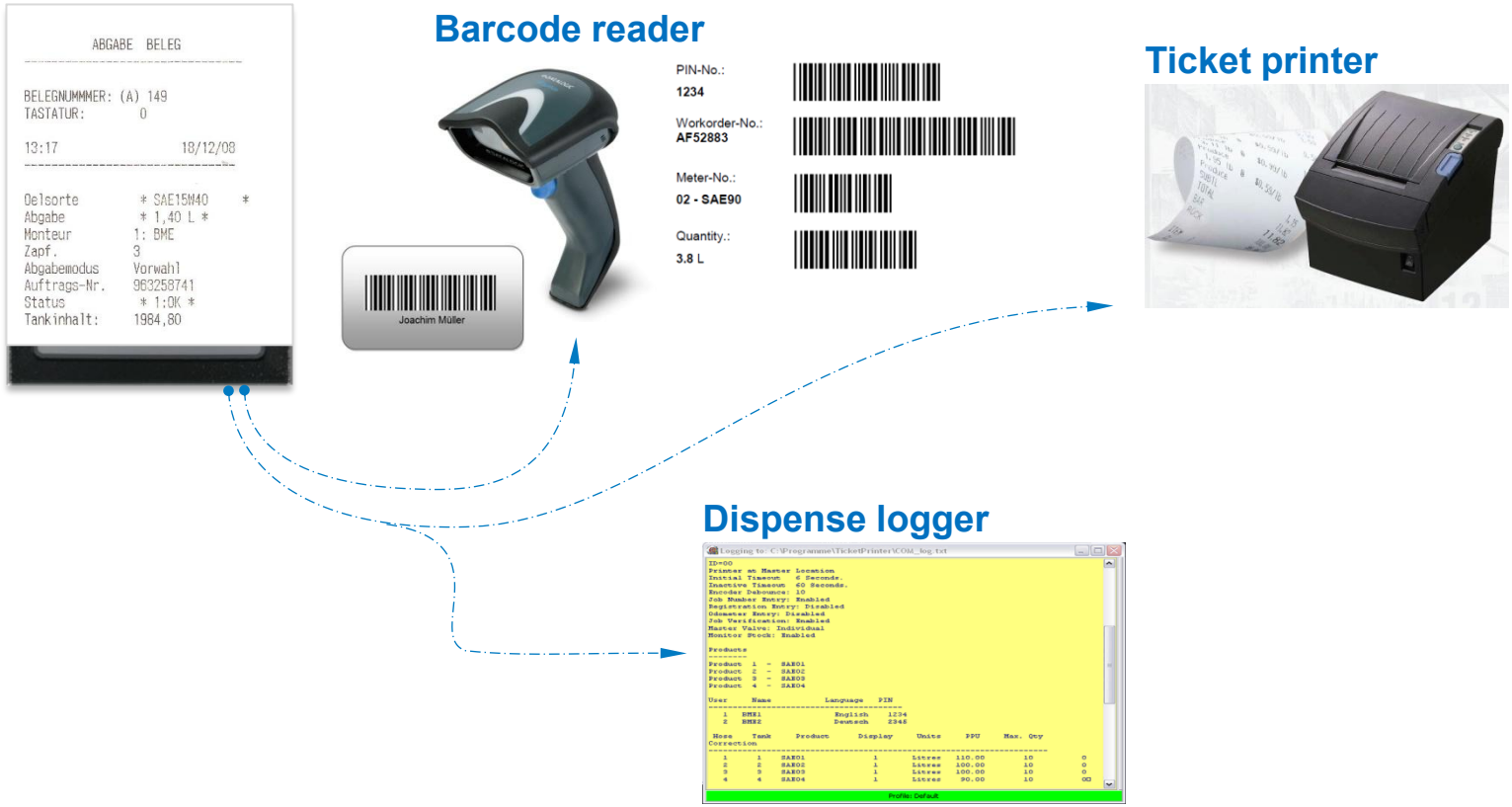
How to set the ID for an I/O control unit: (Default ID = 0)

Change I/O I.D. _2	Enter the new ID then press Enter.

Example: In order to have a direct access to a IO Control Unit, which is configured on ID 2 the keypad has to be set to Keypad ID in the range of 32 and 47.

IO Control unit ID	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
from Keypad ID	0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
to ID	15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255

Keypad – With Ticket Printer or Barcode Reader

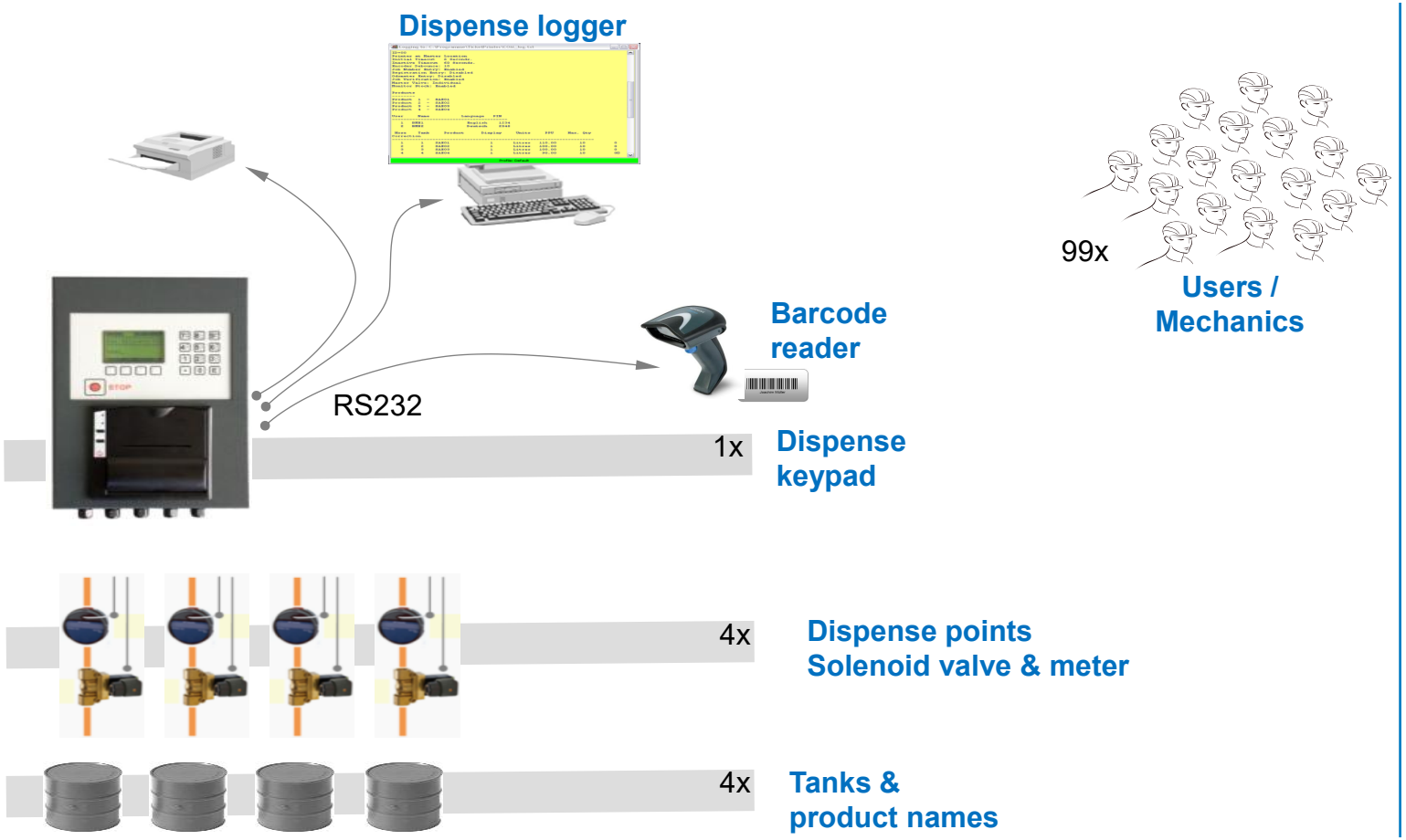


FMS Compact



Badger Meter

Overview – FMS Compact



Specifications

Pulse input:	4x NPN opto-isolated 100 PPL
Valve output:	4x 24VDC, max. load 2A
Pump control:	Relays, max. load 2A at 250VAC or 30 VDC
Barcode scanner:	RS232
Transactions:	Max. 2,999
Users:	Max. 250
Protection class:	IP57

Compatible Flow Meters

FMS compact



MDS 2000



Volume pulse

Industrial meters with pulse output



Integration

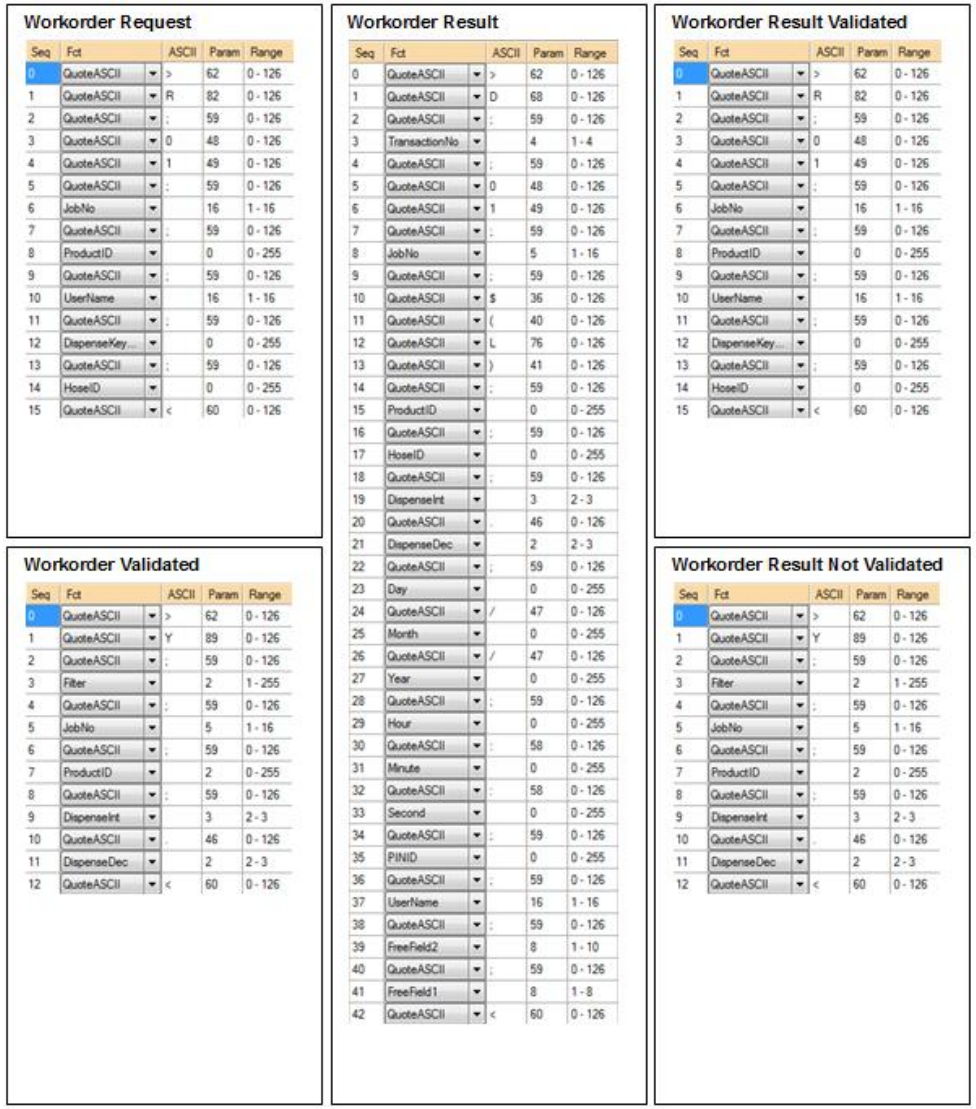


Configuration Host Protocol

The communication can be tailored according to the customer request.

- Workorder (Fluid) Request
- Workorder (Fluid) Validated
- Workorder (Fluid) Refused
- Workorder (Fluid) Result
- Workorder (Fluid) Result Validated
- Workorder (Fluid) Result Refused

Approximately 40 different integrations realized



Workorder Request

Seq	Fct	ASCII	Param	Range
0	QuoteASCII	>	62	0 - 126
1	QuoteASCII	R	82	0 - 126
2	QuoteASCII	;	59	0 - 126
3	QuoteASCII	0	48	0 - 126
4	QuoteASCII	1	49	0 - 126
5	QuoteASCII	;	59	0 - 126
6	JobNo		16	1 - 16
7	QuoteASCII	;	59	0 - 126
8	ProductID		0	0 - 255
9	QuoteASCII	;	59	0 - 126
10	UserName		16	1 - 16
11	QuoteASCII	;	59	0 - 126
12	DispenseKey...		0	0 - 255
13	QuoteASCII	;	59	0 - 126
14	HoseID		0	0 - 255
15	QuoteASCII	<	60	0 - 126

Workorder Result

Seq	Fct	ASCII	Param	Range
0	QuoteASCII	>	62	0 - 126
1	QuoteASCII	D	68	0 - 126
2	QuoteASCII	;	59	0 - 126
3	TransactionNo		4	1 - 4
4	QuoteASCII	;	59	0 - 126
5	QuoteASCII	0	48	0 - 126
6	QuoteASCII	1	49	0 - 126
7	QuoteASCII	;	59	0 - 126
8	JobNo		5	1 - 16
9	QuoteASCII	;	59	0 - 126
10	QuoteASCII	$	36	0 - 126
11	QuoteASCII	(	40	0 - 126
12	QuoteASCII	L	76	0 - 126
13	QuoteASCII	)	41	0 - 126
14	QuoteASCII	;	59	0 - 126
15	ProductID		0	0 - 255
16	QuoteASCII	;	59	0 - 126
17	HoseID		0	0 - 255
18	QuoteASCII	;	59	0 - 126
19	DispenseInt		3	2 - 3
20	QuoteASCII	.	46	0 - 126
21	DispenseDec		2	2 - 3
22	QuoteASCII	;	59	0 - 126
23	Day		0	0 - 255
24	QuoteASCII	/	47	0 - 126
25	Month		0	0 - 255
26	QuoteASCII	/	47	0 - 126
27	Year		0	0 - 255
28	QuoteASCII	;	59	0 - 126
29	Hour		0	0 - 255
30	QuoteASCII	:	58	0 - 126
31	Minute		0	0 - 255
32	QuoteASCII	:	58	0 - 126
33	Second		0	0 - 255
34	QuoteASCII	;	59	0 - 126
35	PINID		0	0 - 255
36	QuoteASCII	;	59	0 - 126
37	UserName		16	1 - 16
38	QuoteASCII	;	59	0 - 126
39	FreeField2		8	1 - 10
40	QuoteASCII	;	59	0 - 126
41	FreeField1		8	1 - 8
42	QuoteASCII	<	60	0 - 126

Workorder Result Validated

Seq	Fct	ASCII	Param	Range
0	QuoteASCII	>	62	0 - 126
1	QuoteASCII	R	82	0 - 126
2	QuoteASCII	;	59	0 - 126
3	QuoteASCII	0	48	0 - 126
4	QuoteASCII	1	49	0 - 126
5	QuoteASCII	;	59	0 - 126
6	JobNo		16	1 - 16
7	QuoteASCII	;	59	0 - 126
8	ProductID		0	0 - 255
9	QuoteASCII	;	59	0 - 126
10	UserName		16	1 - 16
11	QuoteASCII	;	59	0 - 126
12	DispenseKey...		0	0 - 255
13	QuoteASCII	;	59	0 - 126
14	HoseID		0	0 - 255
15	QuoteASCII	<	60	0 - 126

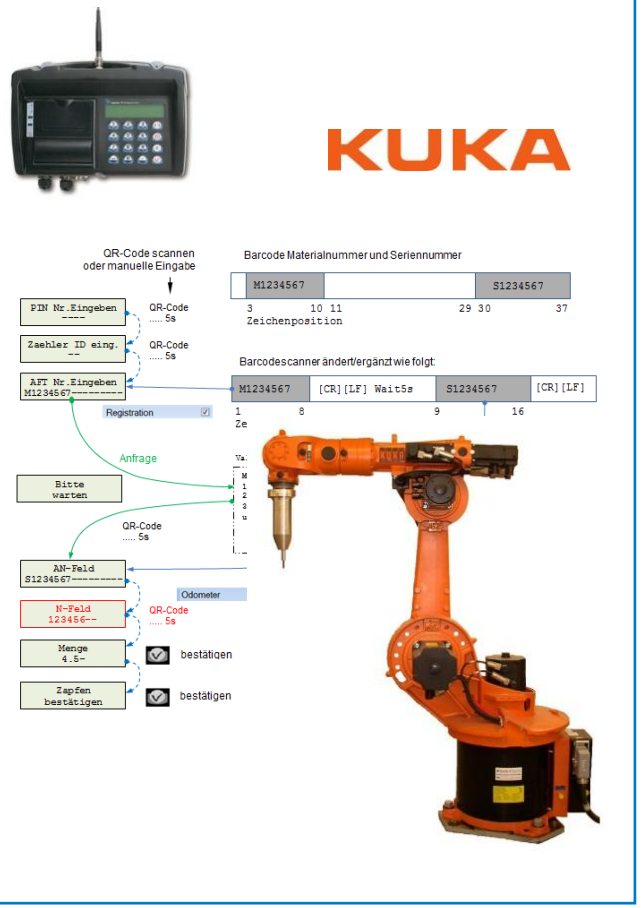
Workorder Validated

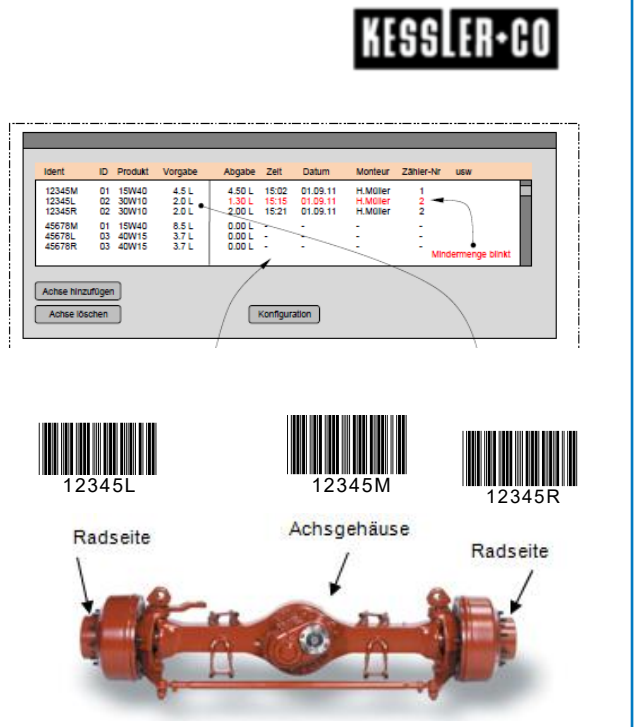
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0	QuoteASCII	>	62	0 - 126
1	QuoteASCII	Y	89	0 - 126
2	QuoteASCII	;	59	0 - 126
3	Filter		2	1 - 255
4	QuoteASCII	;	59	0 - 126
5	JobNo		5	1 - 16
6	QuoteASCII	;	59	0 - 126
7	ProductID		2	0 - 255
8	QuoteASCII	;	59	0 - 126
9	DispenseInt		3	2 - 3
10	QuoteASCII	.	46	0 - 126
11	DispenseDec		2	2 - 3
12	QuoteASCII	<	60	0 - 126

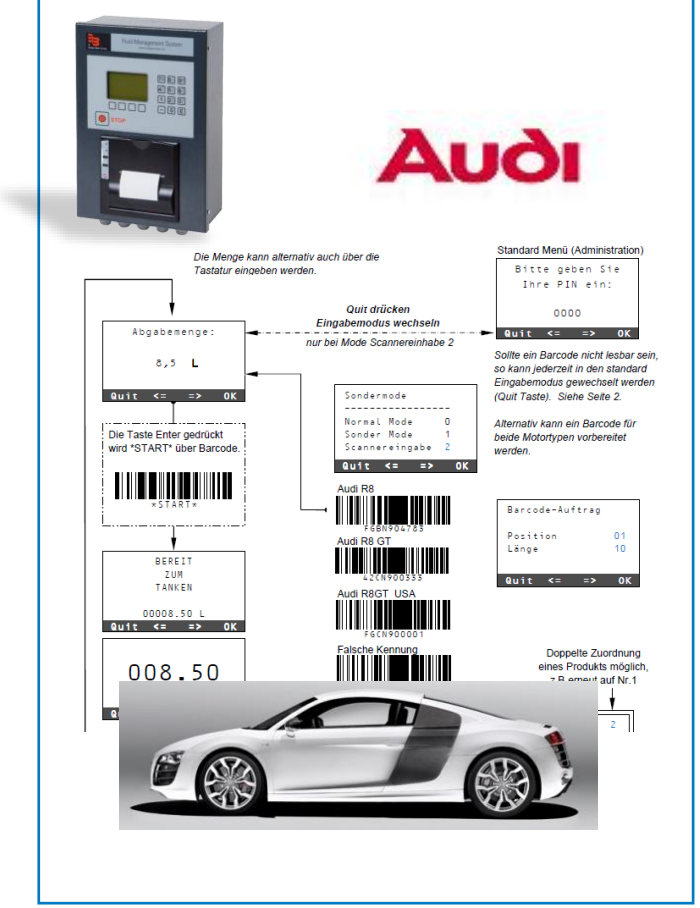
Workorder Result Not Validated

Seq	Fct	ASCII	Param	Range
0	QuoteASCII	>	62	0 - 126
1	QuoteASCII	Y	89	0 - 126
2	QuoteASCII	;	59	0 - 126
3	Filter		2	1 - 255
4	QuoteASCII	;	59	0 - 126
5	JobNo		5	1 - 16
6	QuoteASCII	;	59	0 - 126
7	ProductID		2	0 - 255
8	QuoteASCII	;	59	0 - 126
9	DispenseInt		3	2 - 3
10	QuoteASCII	.	46	0 - 126
11	DispenseDec		2	2 - 3
12	QuoteASCII	<	60	0 - 126

Industrial Application – Quality Control Final Inspection







Installations



Dubai

- 3 different workshop halls connected to central master keypad







Denmark

- Autoline integration & long distance solved with dynamic routing









● Master terminal

● *Dispense Terminal*

Installed interface for DMS

Autoline

Germany

- Second dispense terminal attached in another building



Master terminal

60m behind a parking area



Dispense terminal



Austria

- Various dispense points connected by radio frequency





Lithuania

- Meters and hose reels mounted under the table & trollies





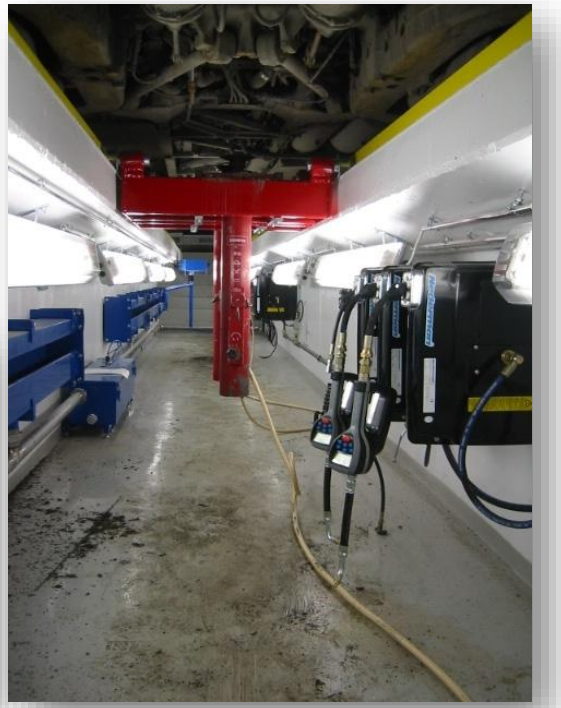


Finland

- Dispense points in the pit







Austria

- RF meters used in dispense station & hose reels







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