Altivar 28
Telemecanique
异步电动机变频器

用户手册



Merlin Gerin
Modicon
Square D
Telemecanique

Schneider Electric
Building a New Electric World

注意事项：当用在 3 相电网 IT 系统时（中性点不接地或高阻接地的系统）EMC 滤波器中接地的电容器必须断开，
请咨询施耐德产品支持部，只有该部的工程师有资格进行这项工作。

变频器通电时，强电部分和某些控制单元已完成与电源的接线必须关上变频器的门（或盖），禁止接触带电部分。（危险）
通常，在操作设备的电气和机械部分前，必须断开电源，ALTIVAR 变频器断电，红色 LED 指示灯灭后，约等待 10 分钟，待电容器放电完毕后，方能操作设备。

正常运转时，可在变频器通电情况下使电动机停车，采用撤消起动命令或改变速度给定来实现，电动机突然起动会对人身安全构成危险，所以系统单有电气封锁是不够的，还需使设备断开电源。
变频器应安装安全设备，在故障时，能关闭变频器和断开电动机。电动机本身可用机械阻力停车，电压变化，电源故障也是造成关机的原因。若停机原因消失后出现的自起动现象会对某些机械和设备产生不安全具有危害性，特别是那些必须符合安全规程的设备。

为此，用户必须采取措施消除自起动的可能性，特别是当电机在非编程条件下停机时，必须使用低速检测器在低速时把变频器的电源切除。

在文件中描述的产品和设备可按使用和技术的合理性作修改和变化。
变频器安装和设定应与IEC国际标准一致和国家标准一致，系统集成商有责任了解欧共体的规范，特别是 EMC 规范。应熟悉在本文件中提供的技术规范。以便符合 EMC 规范的基本要求。

ATV 28 可作为一个部件考虑：是符合欧洲规范即可投入使用的机械或设备（机械规范，EMC 规范），最终用户的责任是使该机械符合上述标准的要求。

Altivar 28 异步电动机变频器

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变频器设定步骤

1 - 供货检查

• 检查印在标签上的变频器型号是否与订单对应的提货单上标注的型号一致。
• 拆箱后检查 ATV 28 确认其在运输过程中没有造成损坏。

2 - 安装变频器，贴好标签(第 4 页)

3 - 确认电源电压在变频器的电压波动范围内(第 5，6 页)



如果电源电压与变频器电压不匹配，将导致变频器损坏。

4 - 变频器接线

• 电源电压
• 电动机：保证端子与电压等级相符
• 逻辑输入控制线
• 速度给定：逻辑或模拟输入

5 - 变频器通电，但无运转命令

6 - 配置

• 电动机的额定频率 bFr (若不是 50Hz 时)
• 若变频器的工厂配置不适合实际应用时，则需配置 I/O 菜单及 drC 菜单的参数

7 - 按以下设置设定菜单

若工厂的设定值不适用时：
• 加速 (ACC) 和减速 (dEC) 斜坡
• 最低速度和最高速度 (LSP 和 HSP)
• 电动机热保护电流 (ItH)，根据电动机铭牌的额定电流
• 其它的参数

8 - 起动变频器

• 若出现问题，参见第 44 页“故障－原因－措施”一章。

应用建议

• 为有助于变频器的编程，特别是当工厂配置的参数已改变时，应填好第 44 页的参数配置及整定表。
• 使用 drC 菜单的 FCS 参数可以返回工厂设定值（设定为 yes 激活此功能，见 33 页）。



注意：必须检查编程的功能与接线方式一致。

工厂配置

工厂设定值

对 Altivar 28 产品，工厂设定值是按最通用的工况条件设置的：

－显示：变频器准备就绪（停车时），电动机频率（运行时）
－额定电动机频率：50Hz
－电动机电压：230V 或 400V，与产品有关
－斜坡：3s
－低速：0 Hz
－高速：50 Hz
－频率环增益：标准
－电动机热电流＝变频器的额定电流
－停车注入的制动电流＝ 0.7 倍的变频器额定电流，0.5s
－恒力矩运行，无传感器磁通矢量控制
－制动出现过电压时，减速斜坡具有自适应功能
－调制频率 4 kHz
－逻辑输入
• LI1, LI2：双向工作，2 线控制
• LI3, LI4：4 个预置速度(0 Hz, 10 Hz, 15 Hz, 50 Hz)
－模拟输入：
• AI1 (0 + 10 V)：速度给定
• AI2 (0 + 10 V)或 AIC (0, 20 mA)：AI1 求和
－继电器 R2：
• 达到速度给定值
－模拟输出 AO (0 - 20 mA)：
• 电动机频率

若上述参数与实际应用一致，则变频器不必改变设定值即可投入工作。

标签

变频器供货时在折页门的下部附有标签：
• 门内侧：接线图
• 有 3 个不干胶标签必要时可贴在变频器附近；编程用主要的参数，故障码和用户设定值的空标签。

变频器型号

单相电源(1) U1...U2: 200...240 V 50/60 Hz

电机		电源			Altivar 28			
铭牌功率(2)		线电流(3)		预期最大短路电流 Isc	线电流	最大瞬时电流(4)	额定负载时耗散功率	型号
		U1	U2					
kW	HP	A	A	kA	A	A	W	
0.37	0.5	7.3	6.1	1	3.3	3.6	32	ATV-28HU09M2
0.75	1	9.8	8.2	1	4.8	6	45	ATV-28HU18M2
1.5	2	16	13.5	1	7.8	10.9	75	ATV-28HU29M2
2.2	3	22.1	18.6	1	11	15	107	ATV-28HU41M2

三相电源(1) U1...U2 : 200...230 V 50/60 Hz

3	-	17.6	15.4	5	13.7	18.5	116	ATV-28HU54M2
4	5	21.9	19.1	5	17.5	24.6	160	ATV-28HU72M2
5.5	7.5	38	33.2	22	27.5	38	250	ATV-28HU90M2
7.5	10	43.5	36.6	22	33	49.5	343	ATV-28HD12M2

三相电源(1) U1...U2 : 380...500 V 50/60 Hz

电机	电源	Altivar 28							
铭牌功率(2)		线电流(3)		预期最大短路电流 Isc	线电流		最大瞬时电流(4)	额定负载时耗散功率	型号
		U1	U2		380V -460V	500V			
kW	HP	A	A	kA	A	A	A	W	
0.75	1	3.9	3.5	5	2.3	2.1	3.5	33	ATV-28HU18N4
1.5	2	6.5	5.7	5	4.1	3.8	6.2	61	ATV-28HU29N4
2.2	3	8.4	7.5	5	5.5	5.1	8.3	81	ATV-28HU41N4
3	-	10.3	9.1	5	7.1	6.5	10.6	100	ATV-28HU54N4
4	5	13	11.8	5	9.5	8.7	14.3	131	ATV-28HU72N4
5.5	7.5	22.1	20.4	22	14.3	13.2	21.5	215	ATV-28HU90N4
7.5	10	25.8	23.7	22	17	15.6	25.5	281	ATV-28HD12N4
11	15	39.3	35.9	22	27.7	25.5	41.6	401	ATV-28HD16N4
15	20	45	40.8	22	33	30.4	49.5	543	ATV-28HD23N4

变频器型号

(1) 额定电源电压：最小 U1，最大 U2。

(2) 额定功率相对于最高调制频率 4 kHz，连续运转。调制频率范围：2-15 kHz。
高于 4 kHz 需电流降额使用，电动机额定电流不能超过如下值：

- 12 kHz 以下降额 10%
- 12 kHz 以上降额 20%

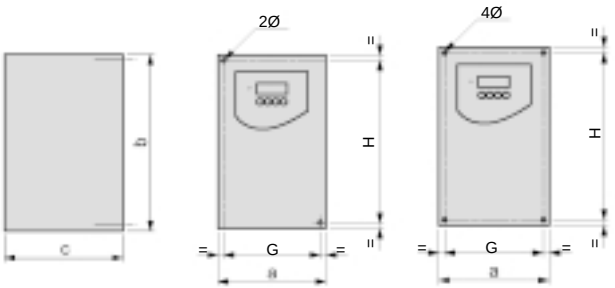
(3) 4 极电动机，最高开关频率 4 kHz 时的典型值，无附加进线电抗器。

(4) 60 s。

(5) 如果最大预期短路电流 Isc 大于表中所列的值，需加装进线电抗器
（参见产品目录）。

安装

尺寸和重量



ATV-28H	a mm	b mm	c mm	G mm	H mm	2Ø mm	4Ø mm	重量 kg
U09M2, U18M2	105	130	140	93	118	5		1.8
U29M2, U18N4, U29N4	130	150	150	118	138		5	2.5
U41M2, U54M2, U72M2, U41N4, U54N4, U72N4	140	195	163	126	182		5	3.8
U90M2, D12M2, U90N4, D12N4	200	270	170	180	255		6	6.1
D16N4, D23N4	245	330	195	225	315		6	9.6

安装要求

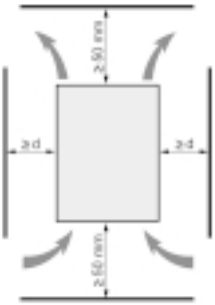
垂直安装偏差，± 10° 以内。

变频器远离发热部件。

四周留有足够的空间，确保冷却空气从底部至顶部的对流循环。

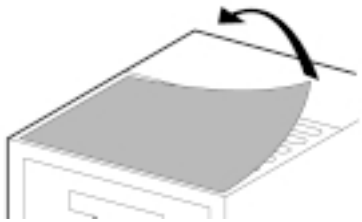
安装

安装及温度条件



装置正面空间至少大于 10mm

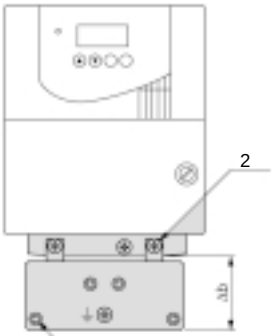
- -10℃ – 40℃：• d ⩾ 50 mm：无特殊要求
- d = 0（变频器并排安装）：去掉保护顶盖，如下图所示，防护等级变为 IP20。
- 40℃ – 50℃：• d ⩾ 50 mm：去掉保护顶盖，防护等级变为 IP20。
  如带顶盖，温度高于 40℃时，每升高 1℃变频器额定电流降额 2.2%。
- d = 0：去掉保护顶盖，防护等级变为 IP20。
  如带顶盖，温度高于 40℃时，每升高 1℃降额 2.2%。
- 40℃ – 60℃：• d ⩾ 50 mm：去掉保护顶盖，防护等级变为 IP20。
  如带顶盖，温度高于 50℃时，每升高 1℃变频器额定电流降额 3%。



安装

电磁兼容性

随主机提供的 EMC 板



ø 4 螺丝固定
EMC 板夹

用 2 个螺丝固定 EMC 板，使 ATV 28 散热板等电位接地，参见左图。

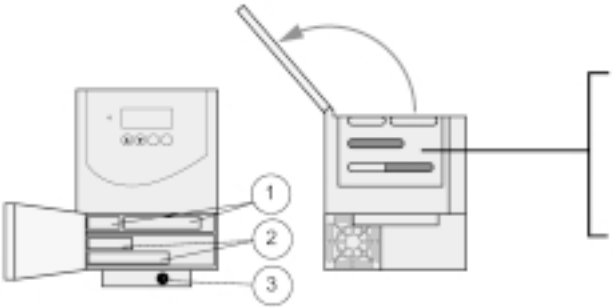
ATV-28H	Δb mm	Ø mm
U09M2, U18M2, U29M2, U41M2, U54M2, U72M2, U18N4, U29N4, U41N4, U54N4, U72N4	48	4
U90M2, D12M2, U90N4, D12N4, D16N4, D23N4	79	4

接线

接线端子

卸掉盖上的螺丝，翻开盖板，即可见端子

图：以 ATV-28HU09M2 为例



1 – 控制
2 – 强电端子（1 或 2 的端子规格取决于额定值）
3 – 电动机电缆接地螺母（仅小功率有）

强电端子

强电端子规格

Altivar ATV-28H	最大接线容量 AWG	 mm^2	拧紧力矩 Nm
U09M2, U18M2	AWG 14	2.5	0.8
U29M2, U18N4, U29N4	AWG 12	3	1.2
U41M2, U54M2, U72M2, U41N4, U54N4, U72N4	AWG 10	5	1.2
U90M2, D12M2, U90N4, D12N4	AWG 5	16	2.5
D16N4, D23N4	AWG 3	25	4.5

接线

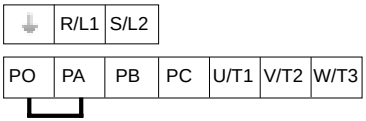
强电端子的功能

端子	功能	系列
⏚	接地	全部规格
L1 L2	3 相电源	全部规格
L3		仅 3 相
PO	直流母线（+）	全部规格
PA	输出到制动电阻	全部规格
PB	输出到制动电阻	全部规格
PC	DC 母线（−）	全部规格
U V W	输出到电动机	全部规格
⏚	接地	U90M2, D12M2, U90N4, D12N4, D16N4, D23N4

强电端子的布置

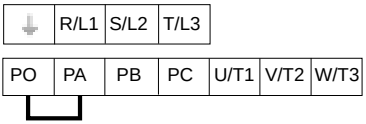
不要拆卸连接 PO 和 PA 端子的接头

ATV-28HU09M2, U18M2, U29M2, U49M2:



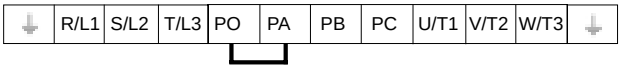
电动机的地线连至散热器或 EMC 板上的接地螺母。

ATV-28HU54M2, U72M2, U18N4, U29N4, U41N4, U54N4, U72N4:



电动机的地线连至散热器或 EMC 板上的接地螺母。

ATV-28HU90M2, D12M2, U90N4, D12N4, D16N4, D23N4:



接线

控制端子

控制端子的规格、功能及布置

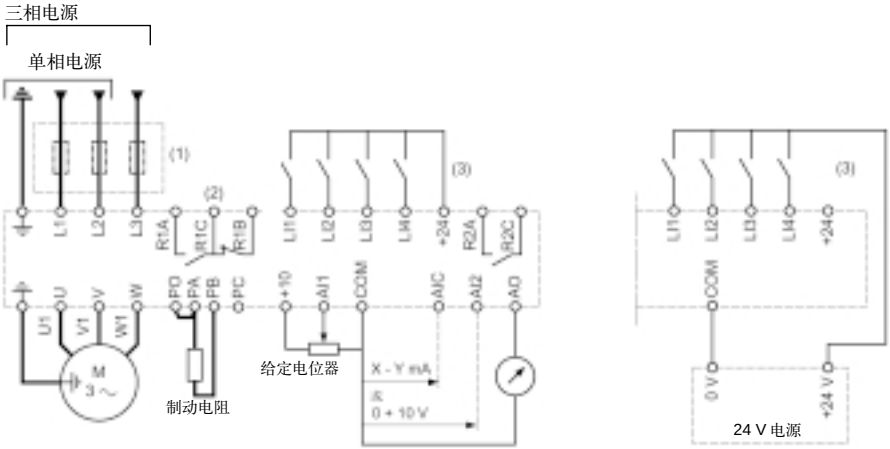


－最大导线截面
1.5mm² - AWG 16
－最大拧紧力矩
0.5 Nm

端子	功能	电气规格
R1A R1B R1C	R1 故障继电器 C/O 接点的 公共点 RIC	最低切换容量 • 10 mA, 直流 5 V 感性负载的最大切换容量
R2A R2C	R2 可编程继电器的 常开接点	($\cos\phi$ = 0.4 , L/R = 7 ms): • 1.5 A, 交流 250 V 和直流 30 V
COM	I/O 公共端	
AI1	模拟电压输入	模拟输入 0 +10 V (最大安全电压 30 V/min, 安全电压 -0.6 V) • 阻抗 30 kΩ • 分辨率 0.01 V • 精度 ± 4.3%，线性度 ± 0.2%，最大值 • 采样时间，最大 5 ms
+10	给 1 -10 kΩ 电位器供电的电源	+10 V (+ 8%-0), 最大 10 mA，带短路和过载保护
AI2 AIC	模拟电压输入 模拟电流输入 AI2 或 AIC 可设定 两者只能用其一	模拟输入 0 +10 V，阻抗 30 kΩ 模拟输入 X-Y mA. X 和 Y 可编程 0-20 mA，阻抗 250Ω 分辨率，精度，采样时间 AI2 或 AIC = AI1。
AO	模拟输出	可编程 0−20 mA 或 4−20 mA • 精度最大 ± 6%，最大负载阻抗 500Ω
LI1 LI2 LI3 LI4	逻辑输入	可编程逻辑输入 • + 24 V 电源(max. 30 V) • 阻抗 3.5 kΩ • < 5 V, 0 态；> 11 V, 1 态 • 最大采样时间 9 ms
+24	逻辑输入电源	+24 V 带短路和过载保护。最低 19 V， 最高 30 V，最大负载电流 100 mA

接线

出厂接线图



(1) 线路电抗器（单相或三相）
(2) 安全继电器接点，远程指示变频器的状态
(3) +24 V 内部电源，如用外部 +24 V 电源，电源的 0 V 接变频器的 COM (公共) 端子，此时不用变频器上的 +24 V 端子。

注意：变频器进线处安装干扰抑制器。抑制感应线路或继电器，接触器，电磁阀等引入的耦合干扰。

附件选择：

见 Altivar 28 目录

接线

接线注意事项

强电部分

电缆截面应符合标准要求

为符合规程有关泄漏电流(> 3.5 mA)要求，变频器必须接地，当上级使用“剩余电流设备”保护才能满足设计标准时，应使用B类设备，可在具有直流成份的系统中运行，若系统中同一条线路上有几台变频器时，则每台变频器必须单独接地，如有必要，应安装线路电抗器（请查阅目录）。

必须使动力电缆远离系统中弱电信号电缆（检测器、PLC、测量装置、视频及电话等）。

控制部分

控制线路与动力电缆分开，对于速度给定和控制线路，我们建议使用屏蔽双绞线，间距25-50mm，屏蔽线的屏蔽层两端分别接地。

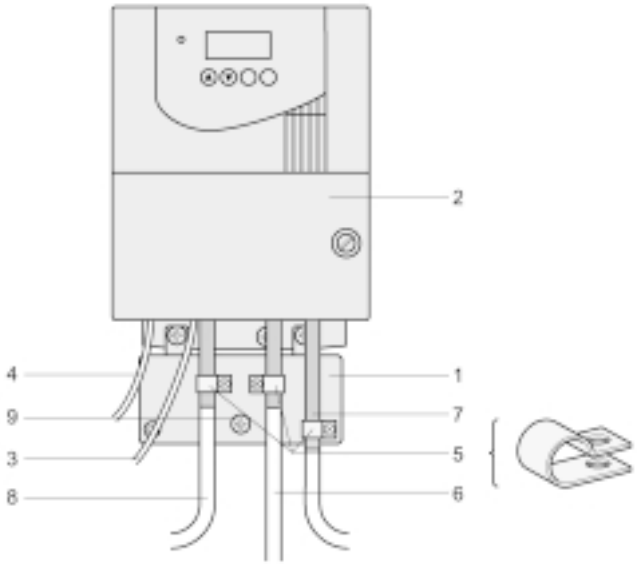
接线

电磁兼容性

原理

- 变频器，电动机和电缆屏蔽层之间应高频等电位接地
- 电动机，制动电阻器和控制系统使用的屏蔽电缆，其两端屏蔽层应 360° 接地，局部可使用金属管道，应确保屏蔽连续性
- 确保电机电缆与电源电缆之间的距离最大

安装图



接线

1 – 随变频器供货的薄钢板接地板 – 按图所示安装。
2 – Altivar 28
3 – 非屏蔽电源接线电缆。
4 – 安全继电器接点输出用非屏蔽线。
5 – 屏蔽电缆 6,7,8 接地用接地卡子，尽量靠近变频器接地：
  – 剥出屏蔽层；
  – 使用合适的电缆卡子按图所示将屏蔽层紧紧固定在板 1 上；
  – 卡子采用不锈钢材料制成，确保接触优良。
6 – 连接电动机的屏蔽电缆，屏蔽层两端接地，屏蔽层不许破裂，若有中间连接端子时，应安装在 EMC 屏蔽的金属盒内。
7 – 控制用屏蔽电缆。
  采用多芯屏蔽电缆，芯线截面 0.5mm^2。
  屏蔽层必须两端接地，且连续无断裂，若有中间连接端子时，应安装在 EMC 屏蔽的金属盒内。
8 – 连接制动电阻器的屏蔽电缆屏蔽层必须两端接地。且连续无中间破裂，若有中间连接端子时，应安装在 EMC 屏蔽的金属盒内。
9 – 如果散热器上的螺丝不可用，对于额定值较小的电动机电缆，接地线可接至此钢板上的接地螺丝。

注意：
• 如果输入滤波器安装在变频器上，用非屏蔽电缆直接与电源相连，滤波器输出电缆可连接变频器的端子 3。
• 尽管变频器、电机和电缆之间有高频等电位连接，仍需要把 PE 线（黄绿线）连接到每台设备的相应端子。

基本功能

故障继电器，不闭锁

变频器上电且无故障时，故障继电器吸合。继电器有 1 个 C/O 接点的公共点。

故障后通过下述操作，解除变频器闭锁：

－变频器断电直至显示和红色 LED 熄灭，然后再加电
－“自动再起动”功能被激活时，自动解除闭锁。
－输入口“故障复位”功能有效时可输入解除闭锁信号

变频器过热保护功能

功能

由安装在散热器或集成在功率模块上的热敏电阻提供保护。

通过电流限幅可间接保护变频器过载，典型的跳闸值为：
－电机电流为 185% 变频器的额定电流，2 s
－电动机电流等于变频器的最大瞬时电流：60 s

变频器散热

变频器解除闭锁（运行方向十给定），风扇自动通电。变频器闭锁后几秒钟断电（电机速度< 0.5 Hz，注入制动结束）。

电动机热保护

功能

通过计算 I^2t 实现热保护。

注意：变频器断电时，电动机热态记忆清零。

可配置 I/O 的应用功能

逻辑输入应用功能

运行方向：正向 / 反向
只能单方向运转的电机，反向运转命令无效。

2 – 线控制
同一个逻辑输入采用“1 ”或 “0”状态来控制开车（正转或反转）或停车。

加电后，或手动复位或发出停车命令后，只有“正向”或“反向”或“直流注入制动”命令复位后电机方可加电，若配置电动机再起动功能时（drc 菜单中的 Art 参数），上述命令不必进行复位即有效。

3 – 线控制
采用 2 个不同的逻辑输入分别控制开车（正转或反转）和停车。
LI1 配置为停车输入，断开后停车（状态 0）。
可记忆开机脉冲，直到发出停机信号。
上电或手动故障复位或停车命令后，电动机只能在“正转”，“反转”和“直流注入制动”命令被复位后，才能上电。

斜坡切换：斜坡 1：ACC，dEC；斜坡 2：AC2，dE2
用两种方法激活该功能：
- 激活逻辑输入 L1x。
- 检测可调频率阈值 Frt。

寸动(JOG)：低速工作脉冲
若寸动接点闭合，激活或不激活运转方向接点，则斜坡为 0.1 s (不考虑 ACC，DEC，AC2 和 DE2 设定值)。若运转方向接点闭合，寸动接点激活，则可使用设定的斜坡。

2 个寸动命令之间的最小时间为 0.5 s，
通过调节菜单，读取参数：
– 寸动速度

可配置 I/O 的应用功能

预置速度

可预置 2,4 或 8 种速度，相应地分别需要 1,2 或 3 个逻辑输入信号。

必须进行下述赋值命令：PS2 (LIx)，然后 PS4 (LIy)，然后 PS8 (LIz)

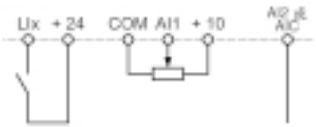
2 种预置速度		4 种预置速度			8 种预置速度			
设定：LIx – PS2		设定：LIx – PS2, LIy – PS4			设定：LIx – PS2 LIy – PS4, LIz – PS8			
LIx	速度给定	LIy	LIx	速度给定	LIz	LIy	LIx	速度给定
0	给定(min = LSP)	0	0	给定(min = LSP)	0	0	0	给定(min = LSP)
1	HSP	0	1	SP2	0	0	1	SP2
		1	0	SP3	0	1	0	SP3
		1	1	HSP	0	1	1	SP4
					1	0	0	SP5
					1	0	1	SP6
					1	1	0	SP7
					1	1	1	HSP

未设定的逻辑输入，按如下顺序赋值：PS8 (LIz)，PS4 (LIy)，PS2 (LIx)

给定切换

用逻辑输入命令切换 2 种给定（AI1 给定和 AI2 或 AIC 给定）。
此功能自动将 AI2 或 AIC 设定为速度给定 2。

接线图



接点打开，给定＝ AI2 或 AIC；
接点闭合，给定＝ AI1；
若 AI2/AIC 设定为 PI 功能， 则操作应与 2 种功能相结合。（见第 22 页）

可配置 I/O 的应用功能

自由停车

电机断电后，仅靠阻力矩停车。
逻辑输入配置为自由停车，且在断开时（状态 0）开始自由停车。

直流注入制动

采用 2 种方法：
－激活（状态 1）配置为此功能的逻辑输入
－频率< 0.5 Hz 时，自动实现

快速停车

制动停车，在制动限制范围内，电流减速斜坡时间除 4。

设定为快速停车功能的逻辑输入断开时（状态 0)实现快速停车。在斜坡末端，无直流注入。

故障复位

清除故障记忆，变频器复位，只有在故障消失后方可进行，
但下述故障除外：OCF（过流）SCF（电动机短路）EEF（外部故障）和 INF（内部故障）需要变频器断电。
当逻辑输入由“0”态转变成“1”态时，则故障清零。

使用串行口强制本机方式

由在线控制方式（串行口）转换为本机方式（通过端子实现）。

可配置 I/O 的应用功能

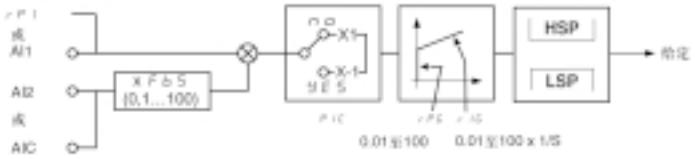
模拟输入应用功能

AI1 总是用作给定

AI2/AIC 设定 (AI2 = 0, +10 V 或 AIC = X-Y mA, X 与 Y = 0-20 mA)
配置 CrL 和 CrH (I/O 配置菜单)

速度给定求和：AI2/AIC 频率给定可与 AI1 求和。

PI 调节器：可设定至 AI2/AIC。允许接一个传感器，并激活 PI 调节器。
PI 功能可通过 I/O 菜单中的 AIC 编程，PI 功能设定所用的两个参数如下：
- AIC=PIA 输入 AIC 配置为 PI 给定，输入 AI1 作为给定信号，AI2 或 AIC 作为反馈信号。PI 调节器的输出成为频率给定。
  应用范围：改变电动机速度的过程控制
- AIC=PII 若配置为内部给定 rPI，可通过键盘输入给定值（SEt 调节菜单），AI2 或 AIC 作为反馈。
  可修改调节菜单 SEt 中的参数
- 调节器比例增益（rPG）
- 调节器比例增益（rIG）
- PI 反馈乘积系数（FBS）：用于调整反馈的最大值从而使之与 PI 调节器给定的最大值相对应。
- 修正值的反向（PIC）：如果 PIC=no，则修正值为正时，电动机转速升高。如：挤压机压力控制。
  如果 PIC=YES，则修正值为正时电动机速度降低，如：通过冷却风机进行温度控制。



可配置 I/O 的应用功能

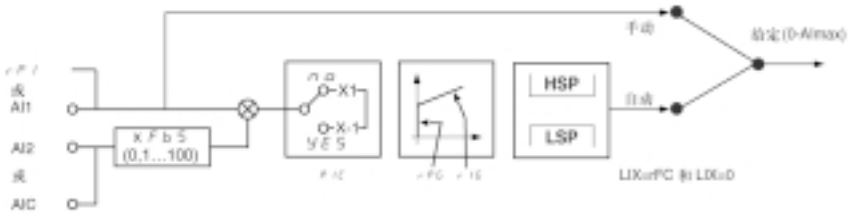
建议：

- 2-线控制模式下（TCC=2C），不要将 Atr（drc 菜单中）设置为 no
- 3-线控制模式下（TCC=3C），PI 调节器输出（给定）必须大于 0.7Hz，如果给定小于0.7Hz，变频器就会误认为此状态为停止命令（设备安全规程）。要重新起动，PI 给定必须大于 0.7Hz。LSP 的设定值必须大于 0.7Hz。要让电动机停机，将 LI1（停车）设定为 0。

注意：PI 功能与端子功能（LCC=Yes）不兼容。

带 PI 功能的“手动－自动”运行

本功能将 PI 调节器和逻辑输入给定切换合二为一。速度给定根据逻辑输入的状态由 AI1 或 PI 功能给定。



可配置 I/O 的应用功能

R2 继电器应用功能

达到频率阈值(FtA) ：若电动机频率≥由调节菜单中 Ftd 设定的频率阈值时继电器接点闭合。

达到速度给定值(SrA) ：电动机频率≥速度给定值时继电器接点闭合。

达到电流阈值(CtA) ：电动机电流≥由调节菜单中 Ctd 设定的电流阈值时，继电器接点闭合。

达到热态值(tSA) ：电动机的热态≥调节菜单中的设定热态阈值时继电器接点闭合。

模拟输出 AO 应用功能

模拟输出 AO 为电流输出，设定值为 0-20 mA 或 4-20 mA。

电动机电流(代码 OCr) ：提供电动机电流有效值的映像。
20 mA 相应于 2 倍的额定电动机热电流值 1th。

电动机频率 (代码 rFr) ：提供变频器计算的电动机频率值。
20 mA 相应于最大频率 rFr。

电动机力矩 (代码 OLO) ：提供电动机力矩绝对值的映像。
20 mA 相应于 2 倍的电动机额定力矩。

功率 (代码 OPr) ：变频器向电动机提供的功率映像。
20 mA 相应于 2 倍的变频器额定功率(典型值)。

可配置 I/O 的应用功能

功能兼容表

应用功能的选择受 I/O 数量以及功能之间互不兼容的限制。本表中未列出的功能是完全兼容的。

	直流注入制动	输入求和	PI 调节器	给定切换	自由停车	快速停车	JOG 操作	预置速度
直流注入制动					↑			
输入求和			●	●				
PI 调节器		●					●	●
给定切换		●						●
自由停车	↓					↓		
快速停车					↑			
JOG 操作			●					↓
预置速度			●	●			↑	

● 不兼容功能

兼容功能

N/A

优先级功能（不能同时激活的功能）：

← ↑ 箭头标志的功能优先级高于其它功能

停止功能优先级高于运行命令。
通过逻辑命令给出的速度给定优先级高于模拟给定

设定－注意事项

通电前和配置变频器



－检查确认电源电压与变频器的输入电压范围一致（见第 4 页），如果电源电压与之不对应会引起变频器损坏。

－逻辑输入断电为“0”态，避免突然起动，否则若菜单中设定输入为运行命令，在退出菜单时电动机会立即起动。

通过进线接触器开关电源



－避免频繁操作 KM1 接触器（会使滤波电容过早老化）。
使用 LI1-LI4 控制变频器
－指令周期必须小于 60 s，否则会损坏负载电阻。

用户调节和扩展功能

若必要，可用显示和按钮修改整定值，扩展一些功能，并且很容易返回到工厂设定值（将 drc 菜单中的 FCS 设为 YES）。有 3 类参数：
－显示：变频器显示值
－调整：运行或停车时进行
－配置：仅能在停车时，以及非制动状态下进行修改，在运行时显示。



检查、改变工作电流的整定值不会出现危险。
修改应在变频器停车时进行。

手动起动

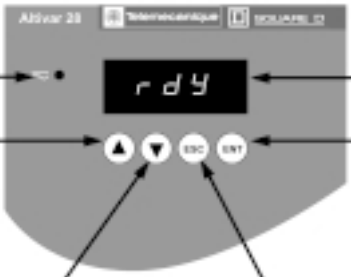
注：在工厂设定模式下接到上电或手动故障复位或停车命令时，电动机只有在“正向”“反向”和“直流注入制动”命令复位后才能上电。如果上述命令没有复位，变频器会显示“rdY”但不会起动。如果设置了自动重起动功能（drc 菜单中的 Atr 参数见第 35 页），则上述命令不需复位。

小功率电动机或无电动机测试

在工厂设定模式下，电动机相缺失检测被激活（OPL=YES），这样可在测试或维护模式下检查变频器，而无需变频器带与之功率相同的电动机（特别是在大功率变频器的情况下）。OPL=no 情况下电动机相缺失检测无效。

编程

功能键和显示



• 红色 LED：通电（DC 母线电压）

• 返回以前的菜单或参数，或增加显示值

• 4 位 7 段显示

• 进入菜单或参数，或保存显示的参数或值

• 转向下一个菜单或参数或减少显示值

• 退出一个菜单或参数，或取消当前显示值返回到内存中的先前值

按 ▲ 或 ▼ 不能贮存选项。

贮存，保存显示的选项：ENT
当贮存一个值时，显示闪烁。

正常显示（无故障，不起动）：
– Init：初始化程序

– rdY：变频器准备就绪

– 43.0：频率给定显示

– dcb：直流注入制动

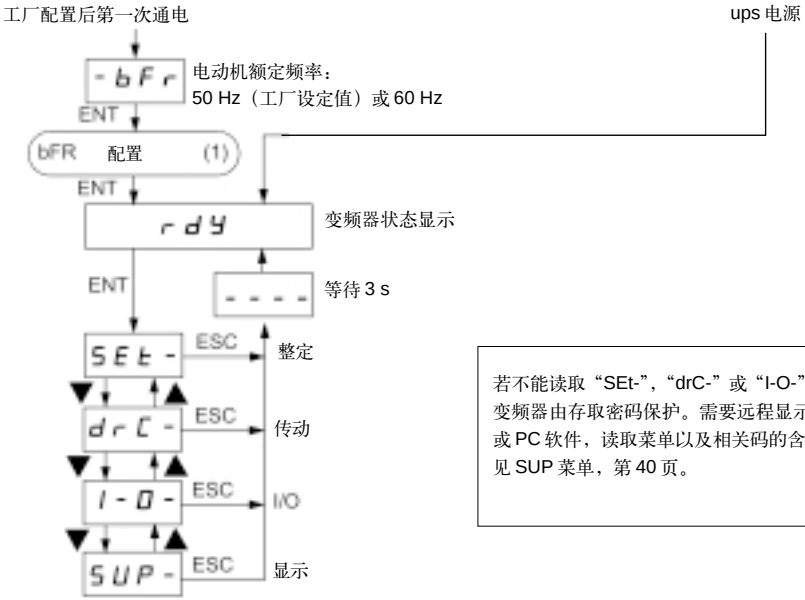
– rtrY：自动再起动进行中

– nSt：自由停车命令

– FSt：快速停车命令

编程

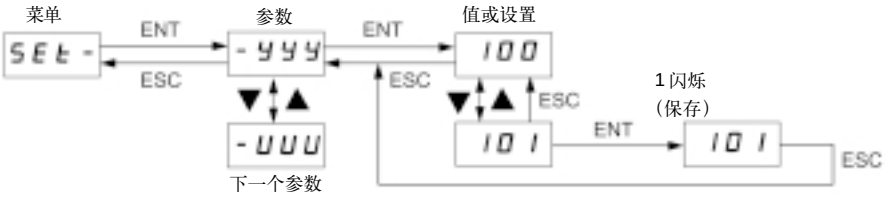
访问菜单



若不能读取“SEt-”，“drC-”或“I-O-”菜单，则变频器由存取密码保护。需要远程显示模块选件或 PC 软件，读取菜单以及相关码的含义。
见 SUP 菜单，第 40 页。

存取参数

例：



(1) 第一次通电配置 bFr，与其它参数相同。

注意：返回到“工厂设定值”后 bFr 方可修改。

本机控制选件

选件包括一个给定电位器，并可操作变频器上的 2 个附加按钮（见与选件一起提供的文件）
– RUN 按钮：控制接通电机，由设定菜单 SEt- 中的 rOt 参数决定运转方向。
– STOP/RESET 按钮：控制电动机停车，清除故障，第一次按按钮时，使电机停止运转，若有直流注入制动时，第二次按按钮，结束该制动。

给定电位器的给定值与模拟输入 AI1 求和。
安装该选件需要特别设置工厂设定的某些功能：

- I/O：

-tCC = OPt	不能再设置
-LI1 = no	不能再设置
-LI2 = PS2	可再设置
-LI3 = PS4	可再设置
-LI4 = PS8	可再设置

- 传动：Atr = no，只有 YES 时可设置

该选件一旦安装，不许再拆除。
该选件必须在变频器断电时连接，否则会引起 InF 故障跳闸。

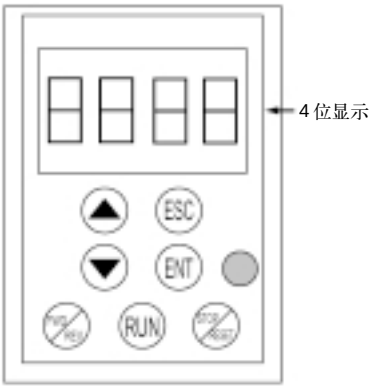


远程显示模块选件

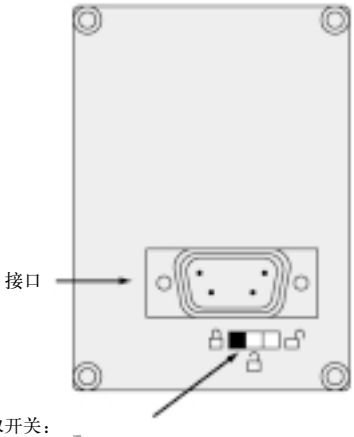
该模块安装在墙挂式或落地式机柜的门上，带电缆的接线器与变频器的串行口连接（见显示模块手册），其显示功能和编程按钮与 ATV 28 上的附加开关（封锁读取菜单）和 3 个按钮（控制变频器）的功能相同。

- FWD/RV：旋转反向
- RUN：电机运转命令
- STOP/RESET：电机停车命令或故障复位
  第一次按按钮使电动机停止运转，若带动力制动时，第二次按按钮时停止该制动。

前面板：



后面板：



存取开关：

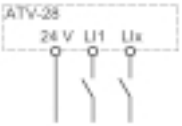
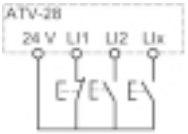
- 位置 ：不可设定和配置
- 位置 ：可设定
- 位置 ：可设定和配置

将 bdr 设为 19.2（I/O 菜单，见第 46 页）

配置

I/O 设置菜单 I - O -

变频器停车和锁定时可修改参数。
在可配置 I/O 的应用功能部分定义功能。

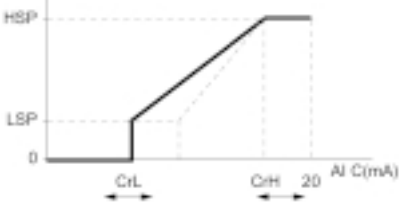
代码	设置	工厂设定值
tCC	端子排控制配置：2 线控制或 3 线控制 2C = 2 线，3C= 3 线，OPt = 有本机控制选件，操作同 3 线控制 2 线控制：输入的断开或闭合状态控制运行或停车 接线举例： LI1：正向 LIX：反向  3 线控制（脉冲控制）：一个脉冲控制起动 接线举例： LI1：停止 LI2：正向 LIx：反向  改变 tCC 的设置，把逻辑输入返回到工厂设定值： • tCC = 2C : LI1 : “正向”，不能再设置 LI2 : rrS （“反向”） LI3 : PS2 LI4 : PS4 • tCC = 3C : LI1 : “停车”不能再设置 LI2 : For（“正向”）不能再设置 LI3 : rrS（“反向”） LI4 : JOG • tCC = OPt : LI1 :不能再设置 LI2 : PS2 LI3 : PS4 LI4 : PS8	2C
LCC	通过远程显示模块方可读取参数：no-YES 通过显示模块上的 STOP/RESET, RUN 和 FWD/REV 按钮控制变频器，由 SEt 菜单中的参数 LFr 给出速度给定，只有自由停车，快速停车，直流制动命令，加在端子排上，若变频器 / 显示模块连接断线，则变频器锁定在 SLF 故障。	no

I/O 设定菜单 I-O- （续）

代码	设置	工厂设定值
-L I2 -L I3 -L I4	逻辑输入 no：未设置 rrS：反向运转（双向工作） rP2：斜坡切换(1) JOG：寸动操作(1) PS2：2 预置速度 PS4：4 预置速度(1) PS8：8 预置速度(1) nSt：自由停车，断电输入激活此功能 dCI：若有命令（并保持），直流动力制动，峰值限制 在 0.5 ItH, 5 s 后 FSt：快速停车，断电输入功能激活 FLO：强制本机方式 rSt：故障复位 rFC：给定切换（断电输入，AIC/AI2 或 P1 功能产生速度给定） • 若 tCC=3C L12= 正向，不能再设置 • 一个功能已设置到另一个输入口，仍出现此功能，但用(ENT)贮存无效 • 下述命令可设置 4 或 8 个预置速度；PS2, PS4, PS8 在反向运转命令时必须撤消预置速度（见可配置的 I/O 应用功能）	rrS PS2 PS4
-A IC	模拟输入 AIC/AI2 no：不设置 SAI：与 A1 相加 PII：PI 调节器反馈：PI 给定由内部调整参数定 rPI (1) PIA：PI 调节器反馈：PI 自动赋值到 AI1 (1) • SAI 能设定（若有逻辑信号输入到 rFC 给定切换） • PII 和 PIA 不能设定（若有逻辑信号加到 LOG 或 PS2） • 若逻辑输入信号 LIX 加到 rFC（给定切换）以及 AIC 信号加到 PII 或 PIA，则在 AI1 上取给定信号(L1x=o)若 L1x=1，则给定信号为 PI 输出	SAI

(1)设置该功能可显示 SET 菜单中相应的整定值，以便能进行调节

I/O 设定菜单 I-O- （续）

代码	设置	工厂设定值
-CrL -CrH	AIC 输入的最小值：0-20 mA 可调 AIC 输入的最大值：4-20 mA 可调 该 2 个参数配置输入电流为 0-20 mA, 4-20 mA, 20-4mA 等 频率  若 A12 为输入，这些参数按比例对应： 4 mA ⟶ 2 V 20 mA ⟶ 10 V 对 0-10V 输入 CrL 为 0 以及 CrH 为 20 这些参数应在 PI 功能被激活后调整。	4 mA 20 mA
-AO	模拟输出 no：不能设定 OCr：电机电流，20 mA 对应于 2 倍的电动机热电流 ItH rFr：电动机频率，20 mA 对应于最高频率 tFr OLO：电动机力矩，20 mA 对应于 2 倍的电动机额定力矩 OPr：变频器输出功率，20 mA 对应于 2 倍的电动机额定功率	rFr
-AOt	模拟输出 0 : 0-20 mA 4 : 4-20 mA	0

I/O 设定菜单 I-O- （续）

代码	设置	工厂设定值
-r2	R2 继电器 no：没有设定 FtA：达到频率门限值，当电动机频率≥由 Ftd (1)设定的门限值时，继电器接点闭合 CtA：达到电流门限值，当电动机电流≥由 Ctd (1)设定的门限值时，继电器接点闭合 SrA：达到给定速度门限值，当电动机电机频率≥速度给定时，继电器接点闭合 tSA：达到热保护门限值，当电动机热保护≥由 ttd (1)设定的门限值时，继电器接点闭合	SrA
-Add	由串行口控制时，变频器的地址：调节范围 1-31	1
-bdr	串行口通讯速率 9.6 = 9600 bits/s 或 19.2 = 19200 bits/s 变频器断电再上电后，方能修改此参数	19.2

(1)设定该功能在 SEt 菜单中可显示相应的整定值以便进行调整。

配置

传动菜单 drC-

变频器停止和锁定时，方能修改参数，只有 Frt, Sfr, nrd 和 SdS 可在运行中调整。

传动性能优化方法：
- 按铭牌值输入参数
- 采用自学习功能(标准的异步电动机)

代码	设定	调整范围	工厂 设定值
-UnS	电动机铭牌所示的额定电压值 按变频器型号调整： ATV28 • • • • M2 ATV28 • • • • N4	 200 – 240 V 380 – 500 V	 230 V 400 V ; bFr = 50 460 V ; bFr = 60
-FrS	电动机铭牌所示的频率值	40 – 400 Hz	50/60 Hz 按 bFr
-tUn	自学习 仅对 V/F 比有效：n 和 nLd（Uft 参数） - no：(IEC 标准电机的工厂设定参数) - donE：(自学习配置完成)：使用已设置的自学习参数 - YES：起动自学习 自学习终了，显示 rdY 或返回到显示 tUn, 显示 donE。若出现 tnF 故障，则应检查电动接线是否正确，若接线正确，还有问题时，使用 L 或 P 比（Uft 参数）。 注意：自学习操作只有在无命令时方能执行。若有“自由停车”或快速停车信号送到逻辑输入时，则输入必须设定为“1”态(“0”态激活有效)	no-donE-YES	no
-tFr	最高输出频率	40 – 400 Hz	60/72 Hz (1.2 x bFr)

配置

传动菜单 drC- （续）

代码	设定	调整范围	工厂 设定值
-UFt	选择电压／频率比 - L：并联或特殊电机，恒力矩 - P：变力矩：风机和泵类应用 - n：恒力矩应用，无传感器磁通矢量控制 - nLd：节能，变力矩应用或不需高动态响应的恒力矩应用	L - P - n - nLd	n
-brA	若负载惯性设定值太低时则激活该功能，自动调整减速时间， 因此可以避免变频器出现 obF 故障。 no：功能未激活。YES：功能激活。 该功能与斜坡上的位置控制或使用制动电阻控制不相兼容。	no – YES	YES
-Frt	斜坡频率切换 输出频率>Frt 时，斜坡时间考虑 AC2 和 dE2，若 Frt = 0 该功能无效， 若逻辑输入信号加到斜坡切换功能 rp2 时，则不会出现此参数	0 – HSP	0 Hz
-SFr	开关频率 可调整开关频率，减少电动机产生的噪声。 高于 4 kHz，变频器输出电流必须降低： •12 kHz 以下：4kHz 以上，频率每升高 1kHz，电流降低 1.25%；12kHz 时，电流降低 10% •12 kHz 以上：频率每升高 1kHz，电流降低 10%+3.3%；15kHz 时电流降低 9.9%	2 – 15 kHz	4.0
-nrd	该功能随时调整制开关频率，可减少电机噪声，no:功能无效， YES:功能有效	no-YES	YES

可在运行时调节参数

传动菜单 drC- （续）

代码	设定	调整范围	工厂设定值
-AtC	故障锁定后，自动再起动。若故障已消失，其他操作条件允许 再起动的话，可通过一系列自动化措施，逐步延长等待周期方式再起动， 等待周期为 1 s, 5 s, 10 s，然后为 1min，假如 6 min 后还不能再起动， 则操作被取消，封锁变频器，直至断电然后再通电， 下述故障允许该功能有效：OHF, OLF, USF, obF, OSF, PHF, OPF, SLF。 若该功能已被激活，则变频器故障继电器保持吸合， 维持速度给定及运行方向。该功能仅在采用 2 线控制(tCC= 2c)时有效。 ⚠ 确保任何事故状态的起动均不会对人身或设备构成危害。 - no：功能无效 -YES：功能有效 -USF：仅在 USF 故障时有效	no - YES - USF	no
-OPL	电动机缺相故障 – YES：功能有效　　– no：功能无效 – OAC：本功能反映变频器输出至电动机的接触器的状态	no - YES	YES
-IPL	进线电源缺相故障 no：功能无效　YES：功能有效 ATV28HU09M2, U18M2, U29M2 U41M2 为单相电源，无此参数 电动机有负载，方可检查此故障（大约 0.7 倍额定功率） 低载时，单相运行不会造成损坏。	no - YES	YES
-SdP	失电停车： 当无电源时，控制电动机停车，根据贮存的动能，沿着一个斜坡 自动停车 no：功能无效　YES：功能有效	no - YES	no

配置

传动菜单 dr C - （续）

编码	设定	调整范围	工厂 设定值
- FLr	下述情况电机可平滑地再起动（捕捉旋转负载）： – 失电或断电 – 故障复位或自动再起动 – 自由停车，逻辑信号控制直流注入制动 no：功能无效　YES：功能有效	no -YES	no
- dr n	为了能在电压降 40% 时工作，降低 USF 故障的跳闸值 no：功能无效 YES：功能有效 ⚠ • 必须使用进线电抗器 • 欠电压工作时，不能保证变频器性能	no - YES	no
- SdS	比例系数用作直观显示 SPd 参数，该值正比于输出频率，机械速度或电机速度。例如： 4 极电机，1500 rpm, 50 Hz –SdS = 30 –SPd = 1500 (50 Hz)	1-200	30
- FCS	返回工厂设定值 no : no YES:下一个显示为 InIt 然后 bFr（起动菜单）	no - YES	no

参数可在运行时调整

整定

调整菜单 SEt-

所调整的参数可在变频器停车或运行时修改，为防止运行时修改有危险，
最好是在停车时修改参数。

代码	设定	调整范围	工厂 设定值
-LFr	通过显示模块进行速度给定 当变频器允许通过显示模块选件控制（修改 I/O 菜单中的 LCC 参数）本参数才会显示。	LSP – HSP	
-rPI	内部 PI 给定： 模拟输入 AIC/AI2 配置为内部 PI 功能时（AIC=PII),该参数出现 rPI 的调整范围是 AI 最大值（频率给定的内部值）的百分比。AImax 与 AI2 输入的电压或 AIC 的输入电流以及 I/O 菜单中的 CrL 和 CrH 参数设定值有关。 $rPI=100\ \frac{(AIC \times FbS) - CrL}{CrH - CrL}$ AIC x FbS ⩽ 10 例：过程控制系统，AIC 配置为 4-20mA，反馈为 10mA $rPI=100\ \frac{10-4}{20-4}=37.5$	0.0 – 100.0%	0.0
-rOt	运行方向 如有本机控制选件，此参数出现。 它定义运行方向： – forward: For – reverse: rrS	For – rrS	For

(1) In 为变频器额定电流值，如产品目录和变频器铭牌所示。

阴影框中的参数只有在 drC 或 I-O 菜单中的相应功能配置后才会出现。

整定

调整菜单 SEt- （续）

代码	设定	调整范围	工厂设定值
-ACC	加速和减速斜坡时间	0,0 – 3600 s	3 s
-dEC	定义了从 0 到额定频率 bFr 的范围确保 dEC 的值与负载比不要太小	0.0 – 3600 s	3 s
-AC2	第 2 次加速斜坡时间	0,0 – 3600 s	5 s
-dE2	第 2 次减速斜坡时间 本参数只有在斜坡切换阈值（drC 菜单中的 Frt 参数）不为 0Hz，或一个逻辑输入配置为斜坡切换时可获取。	0.0 – 3600 s	5 s
-LSP	低速	0 – HSP	0 Hz
-HSP	高速：设定值应满足电动机和应用要求	LSP – tFr	bFr
-ItH	电动机热保护所用电流值。参见电动机铭牌所示的额定电流。 要使热保护无效增加此值至最大值（显示 ntH）	0,20 – 1,15 In (1)	In (1)
-UFr	极低速度时优化力矩 确保 UFr 不要太大，否则会导致电机磁饱和。	0 – 100%	20
-SLP	调整转差补偿值位于电动机额定转速附近。 只有 drC 菜单中的 UFt = n 设定后此参数才会出现。	0.0 – 5.0 Hz	根据变频器输出

(1) In 为变频器额定电流值，如产品目录和变频器铭牌所示。

阴影框中的参数只有在 drC 或 I-O 菜单中的相应功能配置后才会出现。

整定

调整菜单 SEt- （续）

代码	设定	调整范围	工厂 设定值
-FLG	频率环增益，当 brA=YES 和减速时动作。 应用建议： －高惯量设备：在减速时有过压故障时（OBF）逐步减小此值 －快速循环或低惯量设备：逐步增大 FLG 值，来优化减速斜坡的跟踪，限制减速时的过压故障（OBF）。增益值太大会导致运行不稳定	0 至 100%	33
-IdC	DC 注入制动电流 如果注入电流设定值过高，5 秒钟后峰值限制为 0.5 Ith	0.1 ItH 至 In (1)	0.7 In (1)
-tdC	DC 注入至静止制动时间 如果时间增至到 25.5 s，变频器会显示“Cont”，直流注入会持续直至完全停机。	0 至 25,4 s 持续	0.5 s
-JPF	跳跃频率可在 JPF 设定点 2Hz 范围内防止运行。本功能可防止电动机运行于共振点速度，设定为 0 时此功能无效。	0 至 HSP	0 Hz
-JOG	寸动运行频率	0 至 10 Hz	10 Hz
-rPG	PI 调节器比例增益，PI 反馈快速变化时有益于动态性能	0,01 至 100	1
-rIG	PI 调节器积分增益，PI 反馈缓慢变化时有益于静态精度	0.01 至 100/s	1/s
-FbG	PI 反馈乘积系数	0.1 至 100	1
-PIC	PI 调节器的修正值反向 no：正常，YES：反向	no － YES	no

(1) In 是变频器额定电流，参见样本及铭牌数据。

该方框中参数只有在 drC 和 I-O 菜单中配置相应功能后出现。

整定

调整菜单 SEt - （续）

代码	设定	调整范围	工厂 设定值
-SP2	第 2 预置速度	LSP – HSP	10 Hz
-SP3	第 3 预置速度	LSP – HSP	15 Hz
-SP4	第 4 预置速度	LSP – HSP	20 Hz
-SP5	第 5 预置速度	LSP – HSP	25 Hz
-SP6	第 6 预置速度	LSP – HSP	30 Hz
-SP7	第 7 预置速度	LSP – HSP	35 Hz
-FtA	超过电机频率门限值时 R2 继电器接点闭合	0 – HSP	bFr
-CtA	超过电机电流门限值时 R2 继电器接点闭合	0,1 ItH – 1.5 In (1)	1.5 In (1)
ttA	超过电机电机热态门限值时 R2 继电器接点闭合	1 – 118 %	100 %
-tLS	低速运转时间 LSP 定义的周期运行，电机自动请求停车，若频率给定> LSP 或仍有运转命令时，电机则会再起动。 注意：0 相对于无限周期	0 – 25.5 s	0 (no time Imint)

(1) In 是变频器额定电流，参见产品目录及铭牌数据。

该方框中参数只有在 drC 和 I-O 菜单中配置相应功能后出现。

整定

显示菜单 SUP-

选择运行过程中显示的参数，查看上一次故障，软件版本及存取密码等。

选择显示的保存方法：

－按 ENT 键一次：临时性选择，会在下一次上电时清除。

－按 ENT 键二次：永久性选择，第二次按 ENT 时，退出 SUP 菜单。

变频器停止或运转时，下述参数可存取。

代码	参数	单位
-FrH	显示频率给定	Hz
-rFr	显示输出到电动机的频率	Hz
-SPd	显示变频器计算的值(rFr x SdS)	–
-LCr	显示电动机电流	A
-OPr	显示电动机输出功率，变频器的大致输出功率， 100% 对应于变频器额定功率	%
-ULn	显示电源电压	V
-tH	显示电动机热态：100% 对应于额定热态， 高于 118%，显示 OLF 故障（电动机过载）	%
-tHr	显示变频器热态：100% 对应于额定热态，高于 118% 变频器显示 OHF 故障（变频器过热） 低于 70% 时复位	%
-LFt	观察上次出现的故障，若无故障则显示 noF	–
-CPU	软件版本	–
-COd	使用远程显示模块选件或 PC 软件，方可读写参数，存取码：0-999，“0”值为工厂设定值，无存取保护，其他值可闭锁 SEt-, drC- 和 I-O- 菜单 为锁定变频器，可用（▲ ▼）键增加代码号，然后用(ENT)键保存 ⚠ • 不要忘记对代码做标志，因为一旦保存后，就不再显示了 为读取由代码闭锁的变频器菜单时，可用▲(▼ ）键增减代码值，并用 ENT 键确认 • 若显示的读取码正确时会闪烁，为了能读取菜单，然后把代码值设定为“0”值。 • 若显示代码不正确，则变频器返回到原始显示(rdY)	

整定

显示菜单 SUP-

代码	参数
----	变频器状态显示：电动机的运行或故障 - Init：初始化程序 - rdY：变频器准备就绪 - 43.0：显示频率给定 - dcb：直流注入制动（动力制动） - rtrY：自动再起动进行中 - nSt：自由停车命令 - FSt：快速停车命令 - MEmO：保存参数

维护

服务

不需要预防性维护，仅建议定期作如下操作：
– 检查工况及接线松紧
– 检查环境温度和通风是否良好（风扇寿命与工况有关一般为 3-5 年）
– 经常清除灰尘

辅助性维护

若起动时或运行中有问题，应检查与环境有关的注意事项，安装和接线等。

在屏幕上记忆和显示第一个发生的故障：变频器锁定，故障继电器 R1 跳闸。

清除故障

不能复位的故障需关断变频器的电源，等待 LED 和显示屏完全熄灭。
查找故障原因，正确处理。
恢复供电前，故障应消失，并清除故障。

若对此功能已编程，则在故障消失后某些情况下能自动再起动。

显示菜单：

通过显示变频器的状态和电流值，可避免故障出现和查找故障原因。

备件和维修

请向施耐德电气公司产品支持咨询。

故障 – 原因 – 措施

变频器不能起动，无故障显示

• 若对应的逻辑输入未通电源，则设置“快速停车”和“自由停车功能”命令不能使变频器起动，ATV-28显示“nSt”和“FSt”（相应于自由停车和快速停车）。该类功能在“0”态时有效，以实现变频器在接线断开时安全停车。
• 一旦“正向”“反向”“动力制动”等命令已复位，则在通电，手动故障复位以及停车命令后，则电动机方能通电，如不能复位时，变频器显示“rdY”无法起动。若配置了再起动功能（drC 菜单中的 Art 参数），则上述命令不需考虑复位。

不能自动复位的故障

断电复位前必须查找故障原因，并清除，然后再通电。

故障	原因	措施
- OCF 过电流	– 斜坡太短， – 惯性或负载太大 – 机械阻塞 – 电动机相间短路	– 检查整定值 – 检查电动机 / 变频器 / 负载大小 – 检查机械状态 – 检查从变频器至电动机的电能连线
- SCF 电机短路	– 短路或变频器输出侧接地 – 若几台电动机并行连接，变频器输出侧对地泄漏电流较大	– 检查电动机的绝缘或变频器至电动机的连接电缆 – 调整开关频率 – 增加电动机电抗器
- InF 内部故障	– 内部故障	– 检查环境（电磁兼容性） – 检查变频器上电时，本机控制选件是否没有连上或断开 – 将变频器寄出以便检查 / 维修
- tnF 自学习故障	– 特殊电动机或电动机与变频器不匹配 – 电动机没有连至变频器	– 使用 L 或 P 比值 – 检查自学习时电动机的状况 – 如故使用了输出接触器，检查其是否闭合
- EEF 内部故障 （EEPROM）	– 内部故障	– 将变频器寄出进行检查 / 检修 – 环境污染，确保安装符合手册中的规范

故障 – 原因 – 措施

故障消失后用自动再起动功能进行复位的故障

故障	原因	措施
-OHF 变频器过载	– I^2t 过高：>1.85 变频器 In 持续 2s >1.50 变频器 In 持续 60s – 变频器温度过高	– 检查电动机负载， – 检查变频器的通风和环境条件，等待变频器冷却后再起动
-OLF 电动机过载	– 电动机的 I^2t 过高，引起脱扣	– 检查电动机热保护的设定值和负载， 等待变频器冷却后再起动
-OSF 过电压	– 电源电压太高 – 电源电压扰动	– 检查电源电压
-USF 欠压	– 电源电压太低 – 瞬时电压下陷 – 负载电阻损坏	– 检查电源电压和电压参数 – 复位 – 送修
-OBF 运行或减速时过电压	– 制动过猛 – 电源电压太高 – 电源扰动	– 延长减速时间 – 如有必要加装制动电阻 – 如与应用匹配激活 brA 功能 – brA 激活时减小频率环增益 – 检查电源电压
-PHF 带载情况下的相故障	– 变频器电源故障或保险熔断 – 瞬间相故障 –3 相 ATV28 只有一相电源 – 电源变压器太小 – 负载不稳	– 检查电源连线和保险 – 复位 – 使用 3 相电源 – 检查电源变压器功率 – 调整电压环增益 UFr

故障 – 原因 – 措施

故障	原因	措施
- OPF 电动机相故障	– 变频器输出侧缺相 – 输出接触器打开 – 电动机没有连接或电动机功率太低 – 电动机电流瞬时不稳定	– 检查变频器输出至电动机的连线 – 如果使用输出接触器，将 OPL 设为 OAC – 低功率电动机测试或没有电动机：在工厂设定模式下，电动机相缺失故障激活 (OPL=YES) 。为了在测试和维护环境下检查变频器的好坏而无须连接与变频器同功率的电动机 (特别是在大功率变频器场合)，消除电动机相缺失检测 (OPL=NO) – 通过改变 Ith，UnS，UFr 和自学习优化变频器的设定值
- SLF 串行联络故障	– 变频器端口连接不正确 – 本机控制模式下通讯断开	– 检查变频器端口与串行联络之间的接线 – 恢复连线

变频器故障且无故障显示

显示	原因	措施
无代码，LED 没有点亮	– 无电源	检查变频器电源
- rdy 红色 LED 点亮	– LI 输入配置为“自由停车”或“快速停车”，输入没有闭合。停车由于输入丢失而受控。	– 连接输入至 24V，使停车无效。
- rdy or nSt 没有跟踪 减速斜坡	– 高惯量或大的驱动负载	– 复位 DEC 和 FLG

配置 / 设定值

变频器 ATV-28 .....
用户分辨号 .....
软件版本（SUP 菜单中 CPU 参数）：.....
选择存取码：.....
本机控制选件 no□ yes□

菜单 I-O-（输入 / 输出）

代码	工厂设定值	用户设定值	代码	工厂设定值	用户设定值
-LCC	2C		-L12	rrS	
-L13	PS2		-L14	PS4	
-AIC	SAI		-CrL	4 mA	mA
-CrH	20 mA	mA	-AO	rFr	
-AOL	0 mA	mA	-r2	SrA	
-Add	1		-Ldr	19.2	

菜单 drC-（传动）

代码	工厂设定值	用户设定值	代码	工厂设定值	用户设定值
-UnS	V	V	-FrS	Hz	Hz
-tUn	no		-tFr	Hz	Hz
-UFt	n		-brA	YES	
-Frt	0 Hz	Hz	-SFr	4.0 kHz	kHz
-nrd	YES		-Atr	no	
-OPL	YES		-IPL	YES	
-SAP	no		-FLr	no	
-arn	no		-SdS	30	

配置 / 设定值

菜单 SEt - （设定值）

代码	工厂设定值		用户设定值	代码	工厂设定值		用户设定值
-rPI	0.0	%	控制	-rOt	For		控制
-ACC	3.0	s	s	-dEC	3.0	s	s
-AC2	5.0	s	s	-dE2	5.0	s	s
-LSP	0.0	Hz	Hz	-HSP		Hz	Hz
-ItH		A	A	-UFr	20	%	%
-SLP		Hz	Hz	-FLG	33	%	%
-IdC		A	A	-tdC	0.5	s	s
-JPF	0	Hz	Hz	-JOG	10	Hz	Hz
-rPG	1			-rIG	1	/s	/s
-FbS	1			-PIC	no		
-SP2	10	Hz	Hz	-SP3	15	Hz	Hz
-SP4	20	Hz	Hz	-SP5	25	Hz	Hz
-SP6	30	Hz	Hz	-SP7	35	Hz	Hz
-FtH		Hz	Hz	-CtH		A	A
-EtH	100	%	%	-tLS	0.0	s	s

若 drC 或 I-O 菜单中相应功能已配置则显示阴影框中的参数。

IT NEUTRAL POINT CONNECTION : In the event of use on a 3-phase network with a voltage greater than 460V ±10 % with an isolated or high-impedance system (IT), the internal EMC filter capacitors which are connected to ground must be disconnected. Consult Schneider product support who are the only people qualified to perform this operation.
When the speed controller is powered up, the power elements and some of the control components are connected to the line supply. *It is extremely dangerous to touch them. The cover of the speed controller must remain closed*.

In general, the speed controller power supply must be disconnected before any operation on either the electrical or mechanical parts of the installation or machine.
After the ALTIVAR has been switched off and the red LED has gone out, *wait for 10 minutes before working on the equipment*. This is the time required for the capacitors to discharge.
The motor can be stopped during operation by inhibiting start commands or the speed reference while the speed controller remains powered up. If personnel safety requires prevention of sudden restarts, this electronic locking system is not sufficient : *fit a device to remove the power circuit.*

The speed controller is fitted with safety devices which, in the event of a fault, can shut down the speed controller and consequently the motor. The motor itself may be stopped by a mechanical blockage. Finally, voltage variations, especially line supply failures, can also cause shutdowns.
If the cause of the shutdown disappears, there is a risk of restarting which may endanger certain machines or installations, especially those which must conform to safety regulations.

***In this case the user must take precautions against the possibility of restarts, in particular by using a low speed detector to cut off power to the speed controller if the motor performs an unprogrammed shutdown*.**

The products and equipment described in this document may be changed or modified at any time, either from a technical point of view or in the way they are operated. Their description can in no way be considered contractual.
This speed controller must be installed and set up in accordance with IEC international standards and with national standards. Bringing the device into conformity is the responsibility of the systems integrator who must observe the European Union directives, especially the EMC directive.
The specifications contained in this document must be applied in order to comply with the essential requirements of the EMC directive.

The Altivar 28 must be considered as a component : it is neither a machine nor a device ready for use in accordance with European directives (machinery directive and electromagnetic compatibility directive). It is the responsibility of the end user to ensure that the machine meets these standards.

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Steps for Setting Up the Speed Controller

1 - Delivery of the speed controller

• Check that the speed controller reference printed on the label is the same as that on the delivery note corresponding to the purchase order.

• Remove the Altivar 28 from its packaging and check that it has not been damaged in transit.

2 - Fit the speed controller and attach its labels (page 53)

3 - Check that the line voltage is compatible with the voltage range of the drive (page 52)



The drive may be damaged if the line voltage is not compatible

4 - Connect the following to the speed controller :

• The line supply, ensuring that it is **volt free**

• The motor, ensuring that the terminal configuration corresponds to the supply voltage

• The control via the logic inputs

• The speed reference via the logic or analog inputs

5 - Switch on the speed controller, but do not give a run command

6 - Configure :

• The nominal frequency (bFr) of the motor, if it is other than 50 Hz

• The parameters of the I/O menu, and drC menus but if the factory configuration of the speed controller is not suitable for the application

7 - Set the following in the Set menu :

If the speed controller factory settings are not suitable :

• The acceleration (ACC) and deceleration (dEC) ramps

• The minimum (LSP) and maximum (HSP) speeds

• The motor thermal protection current (ItH) to the nominal current marked on the motor rating plate

• Other parameters as required

8 - Start the speed controller

If problems arise, refer to section “Faults - Causes - Remedies”, page 95

Practical recommendations

• To help with programming the speed controller, fill in the configuration and settings tables (page 97), in particular when the factory configuration has been changed.

• It is always possible to return to the factory settings using the FCS parameter in the drC menu (set YES to activate the function see page 86)



Caution : A check must be made to ensure that the functions which have been programmed are compatible with the wiring layout used.

Factory Configuration

Factory settings

The Altivar 28 is factory-set for the most common operating conditions:

- Display : speed controller ready (when stopped), motor frequency (when running)
- Nominal motor frequency : 50 Hz
- Motor voltage : 230V or 400V, depending on product
- Ramps : 3 seconds
- Low speed : 0 Hz
- High speed : 50 Hz
- Frequency loop gain : standard
- Motor thermal current = nominal speed controller current
- Standstill injection braking current = 0.7 x nominal speed controller current, for 0.5 seconds
- Constant torque operation, with sensorless flux vector control
- Automatic adaptation of the deceleration ramp in the event of overvoltage on braking
- Switching frequency 4 kHz
- Logic inputs :
  - LI1, LI2 : 2 directions of operation, 2-wire control on rising edge
  - LI3, LI4 : 4 preset speeds (0 Hz, 10 Hz, 15 Hz, 50 Hz)
- Analog inputs :
  - AI1 (0 + 10 V) : speed reference
  - AI2 (0 + 10 V) or AIC (0, 20 mA) : summing AI1
- Relay R2 :
  - speed reference reached
- Analog output AO (0 - 20 mA) :
  - motor frequency

If the above values are compatible with the application, the speed controller can be used without changing the settings.

Labels

The speed controller is supplied with labels which are stored under the hinged cover :

- 1 label fixed inside the hinged cover : wiring diagram
- 3 self-adhesive labels to be fixed near the speed controller if required : programming of the main parameters, meaning of the fault codes and customer settings (blank label)

Speed Controller References

Single phase supply voltage (1) U1...U2 : 200…240 V 50/60 Hz

Motor		Line supply			Altivar 28			
Power indicated on plate (2)		Line current (3)		Max. prosp. line Isc (5)	Line current	Max. transient current (4)	Power dissipated at nominal load	Reference
		at U 1	at U 2					
kW	HP	A	A	kA	A	A	W	
0.37	0.5	7.3	6.1	1	3.3	3.6	32	**ATV-28HU09M2**
0.75	1	9.8	8.2	1	4.8	6	45	**ATV-28HU18M2**
1.5	2	16	13.5	1	7.8	10.9	75	**ATV-28HU29M2**
2.2	3	22.1	18.6	1	11	15	107	**ATV-28HU41M2**

3-phase supply voltage (1) U1...U2 : 200…230 V 50/60 Hz

3	-	17.6	15.4	5	13.7	18.5	116	**ATV-28HU54M2**
4	5	21.9	19.1	5	17.5	24.6	160	**ATV-28HU72M2**
5.5	7.5	38	33.2	22	27.5	38	250	**ATV-28HU90M2**
7.5	10	43.5	36.6	22	33	49.5	343	**ATV-28HD12M2**

3-phase supply voltage (1) U1...U2 : 380…500 V 50/60 Hz

Motor		Line supply			Altivar 28				
Power indicated on plate (2)		Line current (3)		Max. prosp. line Isc (5)	Line current		Max. transient current (4)	Power dissipated at nominal load	Reference
		at U 1	at U 2		at 380 to 460V	at 500V			
kW	HP	A	A	kA	A	A	A	W	
0.75	1	3.9	3.5	5	2.3	2.1	3.5	33	**ATV-28HU18N4**
1.5	2	6.5	5.7	5	4.1	3.8	6.2	61	**ATV-28HU29N4**
2.2	3	8.4	7.5	5	5.5	5.1	8.3	81	**ATV-28HU41N4**
3	-	10.3	9.1	5	7.1	6.5	10.6	100	**ATV-28HU54N4**
4	5	13	11.8	5	9.5	8.7	14.3	131	**ATV-28HU72N4**
5.5	7.5	22.1	20.4	22	14.3	13.2	21.5	215	**ATV-28HU90N4**
7.5	10	25.8	23.7	22	17	15.6	25.5	281	**ATV-28HD12N4**
11	15	39.3	35.9	22	27.7	25.5	41.6	401	**ATV-28HD16N4**
15	20	45	40.8	22	33	30.4	49.5	543	**ATV-28HD23N4**

Speed Controller References

(1) Nominal supply voltages : min. U1, max. U2.

(2) These power ratings are for a maximum switching frequency of 4 kHz, in continuous operation. The switching frequency is adjustable from 2 to 15 kHz.
Above 4 kHz derate the nominal speed controller current. The nominal motor current should not exceed this value :
• Up to 12 kHz derate by 10%
• Above 12 kHz derate by 20%

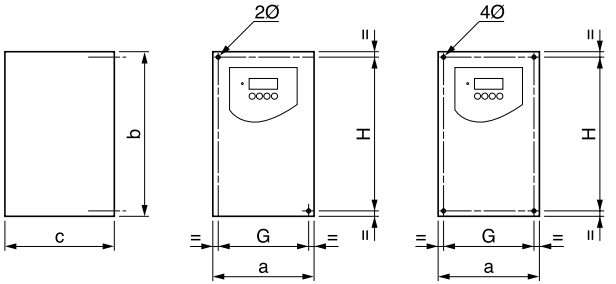
(3) Typical value for a 4-pole motor and a maximum switching frequency of 4 kHz, with no additional line choke.

(4) For 60 seconds.

(5) If Isc line is greater than the values in the table, add line chokes (see catalog).

Mounting

Dimensions and weights



ATV-28H	a mm	b mm	c mm	G mm	H mm	2 Ø mm	4 Ø mm	weight kg
U09M2, U18M2	105	130	140	93	118	5		1.8
U29M2, U18N4, U29N4	130	150	150	118	138		5	2.5
U41M2, U54M2, U72M2, U41N4, U54N4, U72N4	140	195	163	126	182		5	3.8
U90M2, D12M2, U90N4, D12N4	200	270	170	180	255		6	6.1
D16N4, D23N4	245	330	195	225	315		6	9.6

Mounting recommendations

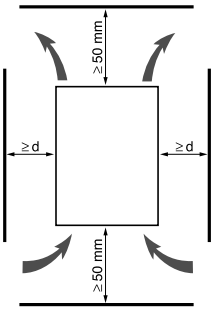
Install the unit vertically, at ± 10°.

Do not place it close to heating elements.

Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

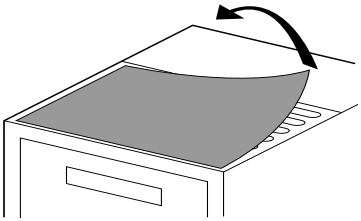
Mounting

Mounting and Temperature Conditions



Free space in front of the unit : 10 mm minimum.

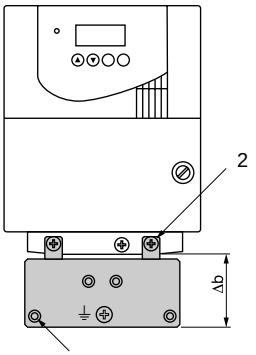
- from -10°C to 40°C:
  - d ≥ 50 mm : no special precautions.
  - d = 0 (speed controllers mounted side by side) : remove the protective cover from the top of the speed controller, as shown below (the degree of protection becomes IP20).
- from 40°C to 50°C:
  - d ≥ 50 mm : remove the protective cover from the top of the speed controller, as shown below (the degree of protection becomes IP20). If the cover is left on, derate the nominal speed controller currentnominal speed controller current by 2.2 % for every °C above 40°C.
  - d = 0 : remove the protective cover from the top of the speed controller, as shown below (the degree of protection becomes IP20), and derate the nominal speed controller current by 2.2 % for every °C above 40°C.
- from 50°C to 60°C:
  - d ≥ 50 mm : remove the protective cover from the top of the speed controller, as shown below (the degree of protection becomes IP20), and derate the nominal speed controller current by 3 % for every °C above 50°C.



Mounting

Electromagnetic compatibility

EMC plate supplied with the speed controller



Fit the EMC plate used for equipotential earthing on the holes of the ATV28 heatsink using the 2 screws provided, as shown in the drawing opposite.

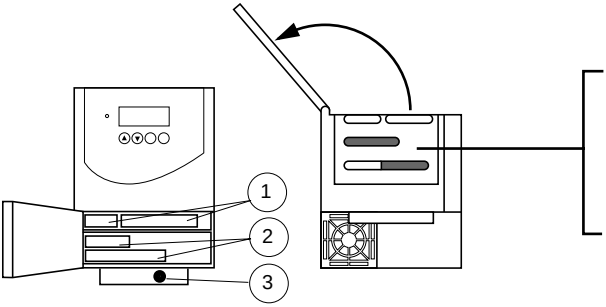
ATV-28H	Δb mm	Ø mm
U09M2, U18M2, U29M2, U41M2, U54M2, U72M2, U18N4, U29N4, U41N4, U54N4, U72N4	48	4
U90M2, D12M2, U90N4, D12N4, D16N4, D23N4	79	4

Wiring

Access to terminals

To access the terminals, undo the screws on the cover and tilt.

Diagram : Example showing ATV-28HU09M2



The speed controllers have a removable plastic cable gland with knock-outs for running cables through, if required (control and braking resistor).

1 - Control
2 - Power (1 or 2 terminals depending on the rating)
3 - Ground screw for motor cable (on low ratings only)

Power terminals

Specifications of power terminals

Altivar ATV-28H	Maximum connection capacity		Tightening torque in Nm
	AWG	mm2	
U09M2, U18M2	AWG 14	2.5	0.8
U29M2, U18N4, U29N4	AWG 12	3	1.2
U41M2, U54M2, U72M2, U41N4, U54N4, U72N4	AWG 10	5	1.2
U90M2, D12M2, U90N4, D12N4	AWG 5	16	2.5
D16N4, D23N4	AWG 3	25	4.5

Wiring

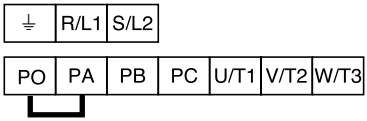
Functions of power terminals

Terminal	Function	For Altivar ATV-28H
⏚	Altivar ground terminal	All ratings
L1 L2	Supply for power terminals	All ratings
L3		3-phase only
PO	DC bus + polarity	All ratings
PA	Output to braking resistor	All ratings
PB	Output to braking resistor	All ratings
PC	DC bus - polarity	All ratings
U V W	Output to motor	All ratings
⏚	Altivar ground terminal	U90M2, D12M2, U90N4, D12N4, D16N4, D23N4

Arrangement of the power terminals

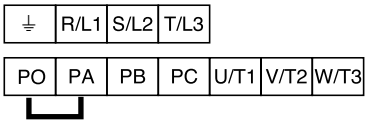
Do not remove the connector linking terminals P0 and PA.

TV-28HU09M2, U18M2, U29M2,U41M2 :



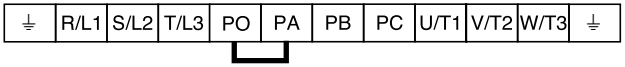
For the motor ground, use the ground screw provided on the heatsink or on the EMC plate.

ATV-28HU54M2, U72M2, U18N4, U29N4, U41N4, U54N4, U72N4 :



For the motor ground, use the ground screw provided on the heatsink or on the EMC plate.

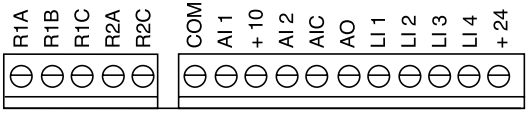
ATV-28HU90M2, D12M2, U90N4, D12N4, D16N4, D23N4 :



Wiring

Control terminals

Arrangement, specifications and functions of the control terminals

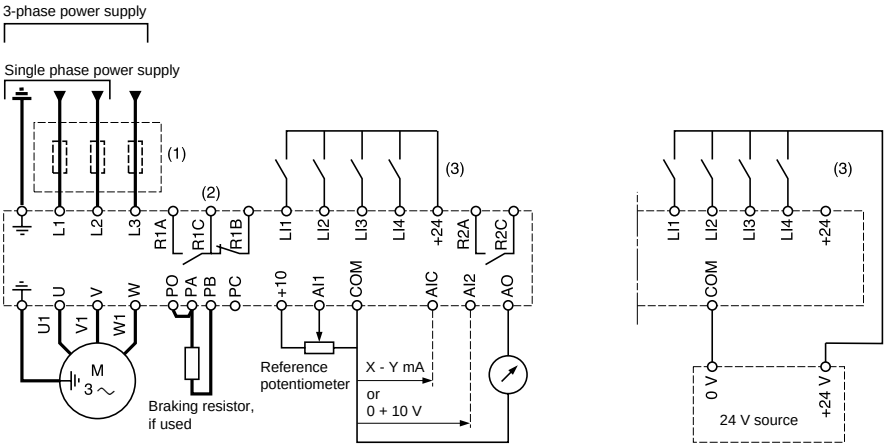


- Maximum connection capacity
  1.5 mm2 - AWG 16
- Max. tightening torque :
  0.5 Nm

Terminal	Function	Electrical specifications
R1A R1B R1C	Common point C/O contact (R1C) of R1 fault relay	Min. switching capacity • 10 mA for 5 V⎓ Max. switching capacity on inductive load (cos φ = 0.4 and L/R = 7 ms) : • 1.5 A for 250 V~ and 30 V⎓
R2A R2C	N/O contact of R2 programmable relay	
COM	I/O common	
AI1	Analog voltage input	Analog input 0 + 10 V (max. safe voltage 30 V/min. safe voltage -0.6 V) • impedance 30 kΩ • resolution 0.01 V, 10-bit converter • precision ± 4.3%, linearity ± 0.2%, of max. value • acquisition time 5 ms max
+10	Power supply for potentiometer 1 to 10 kΩ	+10 V (+ 8 % - 0), 10 mA max, protected against short-circuits and overloads
AI2 AIC	Analog voltage input Analog current input AI2 or AIC are assignable Use either, but not both	Analog input 0 + 10 V, impedance 30 kΩ Analog input X - Y mA. X and Y can be programmed from 0 to 20 mA, impedance 250 Ω Resolution, precision, and acquisition time of AI2 or AIC = AI1
AO	Analog output	Output can be programmed for 0 - 20 mA or 4 - 20 mA • Precision ± 6% of the max. value, max. load impedance 500 Ω
LI1 LI2 LI3 LI4	Logic inputs	Programmable logic inputs • + 24 V power supply **(max. 30 V)** • Impedance 3.5 kΩ • State 0 if < 5 V, state 1 if > 11 V • Acquisition time 9 ms max.
+ 24	Logic input power supply	+ 24 V protected against short-circuits and overloads, min. 19 V, max. 30 V. Max. customer current available 100 mA

Wiring

Wiring diagram for factory settings



(1) Line choke, if used (single phase or 3-phase)
(2) Safety relay contacts, for remote indication of the speed controller status
(3) Internal + 24 V. If an external + 24 V source is used, connect the 0 V from that source to the COM terminal, and do not use the + 24 terminal on the speed controller

Note : Fit interference suppressors to all inductive circuits near the speed controller or coupled to the same circuit (relays, contactors, solenoid valves, etc).

Choice of associated components :
See Altivar 28 catalog.

Wiring

Wiring recommendations

Power

Observe the cable cross-sectional areas recommended in the standards.

The speed controller must be earthed, in order to comply with regulations concerning high leakage currents (over 3.5 mA). When the use of an upstream "residual current device" for protection is required by the installation standards, a "type B" device must be used, which will operate even in the presence of DC components. If the installation has several speed controllers on the same line, each controller must be earthed separately. If necessary, fit a line choke (consult the catalog).

Keep the power cables separate from circuits in the installation with low level signals (detectors, PLCs, measuring apparatus, video, telephone).

Control

Keep the control circuits and the power cables apart. For control and speed reference circuits, we recommend using shielded twisted cables with a pitch of between 25 and 50 mm, connecting the shielding to ground at each end.

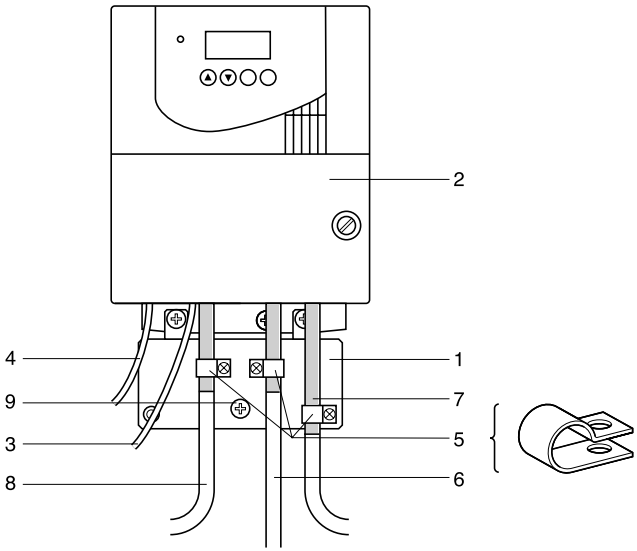
Wiring

Electromagnetic compatibility

Principle

• Grounds between speed controller, motor and cable shielding should have "high frequency" equipotentiality
• Use shielded cables with shielding connected to ground at 360° at both ends for the motor cable, braking resistor (if used) and control-command cables. Conduit or metal ducting can be used for part of the shielding length, provided that there is no break in continuity
• Ensure maximum separation between the power supply cable (line supply) and the motor cable

Installation diagram



Wiring

1 - Sheet steel grounded casing supplied with the speed controller, to be fitted as indicated on the diagram.
2 - Altivar 28.
3 - Non-shielded power supply wires or cables.
4 - Non-shielded wires for the output of the safety relay contacts.
5 - Attachment and connection to ground of the shielding of cables 6, 7 and 8 as close as possible to the speed controller :
- strip the shielding
- use cable clamps of an appropriate size on the parts from which the shielding has been stripped, to attach them to the casing 1
The shielding must be clamped onto the casing sufficiently tightly to create a good contact.
- types of clamp : stainless steel
6 - Shielded cable for connecting the motor, with shielding connected to ground at both ends.
This shielding must be unbroken, and if there are intermediate terminals, they must be in EMC shielded metal boxes.
7 - Shielded cable for connecting the control.
For applications which require a large number of conductors, small cross-sections must be used (0.5 mm^2).
The shielding must be connected to ground at both ends. This shielding must be unbroken, and if there are intermediate terminals, they must be in EMC shielded metal boxes.
8 - Shielded cable for connecting the braking resistor, if used. The shielding must be connected to ground at both ends. This shielding must be unbroken, and if there are intermediate terminals, they must be in EMC shielded metal boxes.
9 - Ground screw for the motor cable with low ratings, as the screw on the heatsink is inaccessible.

Note :
• If an additional input filter is used, it is mounted on the speed controller, and connected directly to the line supply by an unshielded cable. Connection 3 on the speed controller is then made using the filter output cable.
• Although there is an HF equipotential ground connection between the speed controller, the motor and the cable shielding, it is still necessary to connect the PE protective conductors (green-yellow) to the appropriate terminals on each of the devices.

Basic Functions

Fault relay, unlocking

The fault relay is energized when the speed controller is powered up and there is no fault. It has a common point C/O contact.

The speed controller is unlocked after a fault by the following operations :

- Powering down the speed controller until the display and the red LED extinguish, then powering up again
- Automatically when the "automatic restart" function has been activated
- Via a logic input when this input is assigned to the "fault reset" function

Speed controller thermal protection

Functions :

Thermal protection by thermistor fitted on the heatsink or integrated in the power module.

Indirect protection of the speed controller against overloads by current limit. Typical tripping points :
- motor current = 185 % of nominal speed controller current : 2 seconds
- motor current = maximum speed controller transient current : 60 seconds

Speed controller ventilation

The fan is powered automatically when the speed controller is unlocked (operating direction + reference). It is powered down a few seconds after the speed controller is locked (motor speed < 0.5 Hz and injection braking completed).

Motor thermal protection

Function :

Thermal protection by calculating I^2t

Caution : The motor thermal state memory is reset to zero when the speed controller is switched off.

Configurable I/O Application Functions

Logic input application functions

Direction of operation : forward / reverse

Reverse operation can be disabled for applications with a single direction of motor rotation.

2-wire control :

Run (forward or reverse) and stop are controlled by the same logic input, for which state 1 (run) or 0 (stop) is taken into account.
On power-up or a manual fault reset or after a stop command, the motor can only be powered once the "forward", "reverse" and "DC injection stop" commands have been reset. If the automatic restart function is configured (parameter Atr in the drC menu), these commands are taken into account without a reset being necessary.

3-wire control :

Run (forward or reverse) and stop are controlled by 2 different logic inputs.
LI1 is always assigned to the stop function. Stop occurs on opening (state 0).
The pulse on the run input is memorized until the stop input is opened.
On power-up or a manual fault reset or after a stop command, the motor can only be powered once the "forward", "reverse" and "DC injection stop" commands have been reset.

Ramp switching : 1st ramp : ACC, dEC ; 2nd ramp : AC2, dE2

This can be activated in 2 ways :
- By activating a logic input LIx or by detection of an adjustable frequency threshold Frt.

Step by step operation (JOG): Low speed operation pulse

If the JOG contact is closed and an operating direction is activated or deactivated, the ramps are 0.1 s regardless of the ACC, dEC, AC2 and dE2 settings.

The minimum time between 2 JOG operations is 0.5 seconds.
Parameter which can be accessed in the adjust menu :
- JOG speed

Configurable I/O Application Functions

Preset speeds

2, 4 or 8 speeds can be preset, and requiring 1, 2, or 3 logic inputs respectively.

The following assignment order must be observed : PS2 (LIx), then PS4 (LIy), then PS8 (LIz).

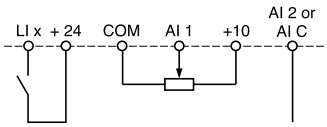
2 preset speeds		4 preset speeds			8 preset speeds			
Assign : LIx to PS2		Assign : LIx to PS2, then LIy to PS4			Assign : LIx to PS2, then LIy to PS4, then LIz to PS8			
LIx	speed reference	LIy	LIx	speed reference	LIz	LIy	LIx	speed reference
0	Reference (min = LSP)	0	0	Reference (min = LSP)	0	0	0	Reference (min = LSP)
1	HSP	0	1	SP2	0	0	1	SP2
		1	0	SP3	0	1	0	SP3
		1	1	HSP	0	1	1	SP4
					1	0	0	SP5
					1	0	1	SP6
					1	1	0	SP7
					1	1	1	HSP

To unassign the logic inputs, the following order must be observed : PS8 (LIz), then PS4 (LIy), then PS2 (LIx).

Reference switching :

Two references are switched (AI1 reference and AI2 or AIC reference) by a command on a logic input. This function automatically assigns AI2 or AIC to speed reference 2.

Connection diagram



Contact open, reference = AI2 or AIC
Contact closed, reference = AI1

If AI2/AIC is assigned to the PI function, operation combines both functions, (see page 71).

Configurable I/O Application Functions

Freewheel stop

Stops the motor by the resistive torque only. The motor power supply is cut.
Freewheel stop occurs when the logic input assigned to this function opens (state 0).

DC injection stop

This can be activated in 2 ways :
- by activation of a logic input assigned to this function (state 1)
- automatically if the frequency is below 0.5 Hz

Fast stop :

Braked stop with the current deceleration ramp time divided by 4 within the limits of the braking possibilities.
Fast stop occurs when the logic input assigned to this function opens (state 0). On this type of stop, no DC injection at the end of the ramp.

Fault reset :

Clears the memorized fault and resets the speed controller if the cause of the fault has disappeared, except for OCF (overcurrent), SCF (motor short-circuit), EEF and InF (internal faults) faults, which require the controller to be powered down.
The fault is cleared when the logic input assigned to this function changes from 0 to 1.

Forced local mode when using the serial link :

Changes from line control mode (serial link) to local mode (control via the terminal block).

Configurable I/O Application Functions

Analog input application functions

Input AI1 is always the reference.

Assignment of AI2/AIC (AI2 = 0, +10 V or AIC = X-Y mA, X and Y can be configured from 0 to 20mA)

Assign **CrL** and **CrH** (I/O assignment menu)

Summing speed reference : The frequency reference from AI2/AIC can be summed with AI1.

PI regulator : Can be assigned to AI2/AIC. Allows a sensor to be connected and activates the PI regulator.

The PI function is programmed via AIC in the I/O menu. The 2 parameters used to configure the PI function are:

- **AIC = PIA** configuration of the PI reference at the terminal on AI1. The reference is input AI1 and the feedback is AI2 or AIC. The PI regulator output becomes the frequency reference.

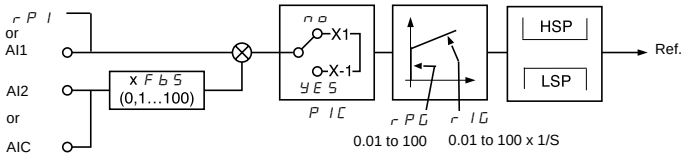
Application: process control which can be controlled by the motor speed.

- **AIC = PII** configuration of the internal reference **rPI** which can be adjusted via the keypad (**SEt** adjust menu). The feedback is AI2 or AIC.

Parameters which can be accessed in the adjust menu **SEt**:

- regulator proportional gain (rPG)
- regulator integral gain (rIG)
- PI feedback multiplication coefficient (FbS) : is used to adjust the max. value of the feedback so that it corresponds to the max. value of the PI regulator reference.
- reversal of the direction of correction (PIC) : if PIC = no, the motor speed increases when the error is positive, example: pressure control with a compressor.

if PIC = YES, the motor speed decreases when the error is positive, example: temperature control via a cooling fan.



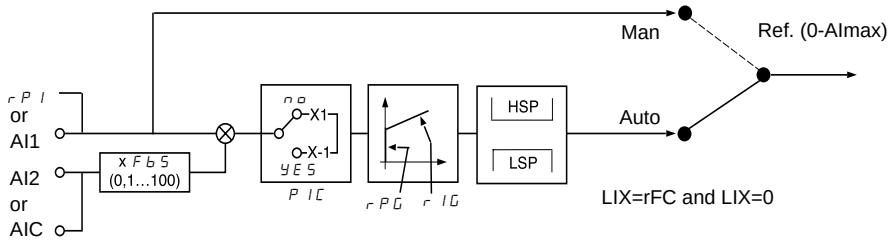
Configurable I/O Application Functions

Recommendations:
• In 2-wire control (TCC=2C), do not assign Atr to no (drC menu)
• In 3-wire control (TCC=3C), the PI output (ref.) must be greater than 0.7 Hz. If it is less than 0.7 Hz, this state is interpreted as a stop (machine safety regulations). In order to restart, the PI ref. must be greater than 0.7 Hz. LSP must be set to a value greater than 0.7 Hz. To stop the motor, set LI1 (STOP) = 0

Notes:
The PI function is incompatible in terminal mode (LCC = Yes).

"Manual - Automatic" operation with PI

This function combines the PI regulator and reference switching by a logic input. The speed reference is given by AI1 or by the PI function, depending on the state of the logic input.



Configurable I/O Application Functions

R2 relay application functions

Frequency threshold reached (FtA) : The relay contact is closed if the motor frequency is greater than or equal to the frequency threshold set by Ftd in the adjust menu.

Speed reference reached (SrA) : The relay contact is closed if the motor frequency is greater than or equal to the speed reference value.

Current threshold reached (CtA) : The relay contact is closed if the motor current is greater than or equal to the current threshold set by Ctd in the adjust menu.

Thermal state reached (tSA) : The relay contact is closed if the motor thermal state is greater than or equal to the thermal state threshold set by ttd in the adjust menu.

Analog output AO application functions

Analog output AO is a current output, which can be configured for 0 - 20 mA or 4 - 20 mA.

Motor current (code OCr) : supplies the image of the motor rms current.
20 mA corresponds to twice the nominal drive current.

Motor frequency (code rFr) : supplies the motor frequency calculated by the speed controller.
20 mA corresponds to the maximum frequency (parameter tFr).

Motor torque (code OLO) : supplies the image of the motor torque as an absolute value.
20 mA corresponds to twice the nominal motor torque (typical value).

Power (code OPr) : supplies the image of the power supplied to the motor by the speed controller.
20 mA corresponds to twice the nominal speed controller power (typical value).

Configurable I/O Application Functions

Function compatibility table

The choice of application functions may be limited by the number of I/O and by the fact that some functions are incompatible with one another. Functions which are not listed in this table are fully compatible.

	DC injection braking	Summing input	PI regulator	Reference switching	Freewheel stop	Fast stop	JOG operation	Preset speeds
DC injection braking					↑			
Summing input			●	●				
PI regulator		●					●	●
Reference switching		●						●
Freewheel stop	←					←		
Fast stop					↑			
JOG operation			●					←
Preset speeds			●	●			↑	

● Incompatible functions

Compatible functions

N/A

Priority functions (functions which cannot be active at the same time) :

← ↑ The function marked with the arrow takes priority over the other.

Stop functions take priority over run commands.
Speed references via logic command take priority over analog references.

Setup - Preliminary Recommendations

Prior to powering up and configuring the speed controller



- Check that the line voltage is compatible with the supply voltage range of the drive (see page 54). The drive may be damaged if the line voltage is not compatible.
- Power down the logic inputs (state 0) to prevent any accidental startup. Otherwise, an input assigned to the run command may cause the motor to start immediately when exiting the configuration menus.

In power switching via line contactor



- Avoid operating contactor KM1 frequently (premature ageing of the filter capacitors). Use inputs LI1 to LI4 to control the speed controller.
- These instructions are vital for cycles < 60 s, otherwise the load resistor may be damaged.

User adjustment and extension of functions

If necessary, the display and the buttons can be used to modify the settings and to extend the functions described in the following pages. It is very easy to return to the factory settings using the FCS parameter in the drC menu (set YES to activate the function, see page 86).
There are three types of parameter :
- display : values displayed by the speed controller
- adjustment : can be changed during operation or when stopped
- configuration : can only be modified when stopped and no braking is taking place. Can be displayed during operation.



Check that changes to the current operating settings do not present any danger. Changes should preferably be made with the speed controller stopped.

Manual starting

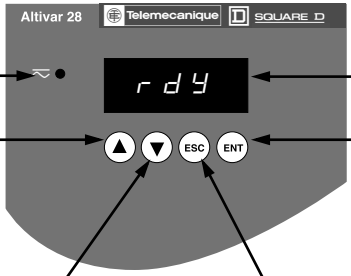
Important: In factory settings mode, on power-up or a manual fault reset or after a stop command, the motor can only be powered once the "forward", "reverse" and "DC injection stop" commands have been reset. If they have not been reset, the drive will display "rdY" but will not start. If the automatic restart function is configured (parameter Atr in the drC menu see page 85), these commands are taken into account without a reset being necessary.

Test on a low power motor or without a motor

In factory settings mode, motor phase loss detection is active (OPL = YES) To check the drive in a test or maintenance environment without having to switch to a motor with the same rating as the drive (particularly useful in the case of high power drives), deactivate motor phase loss detection (OPL = no).

Programming

Functions of the keys and the display



• Red LED : powered up (DC bus voltage)

• 4 seven-segment displays

• Returns to the previous menu or parameter, or increases the displayed value

• Enters a menu or a parameter, or saves the displayed parameter or value

• Goes to the next menu or parameter, or decreases the displayed value

• Exits a menu or parameter, or aborts the displayed value to return to the previous value in the memory

Pressing ▲ or ▼ does not store the choices.

Store, save the displayed choice : ENT
The display flashes when a value is stored.

Normal display, with no fault present and no startup :
- Init : Initialization sequence

- rdY : Speed controller ready

- 43.0 : Display of the frequency reference

- dcb : DC injection braking in progress

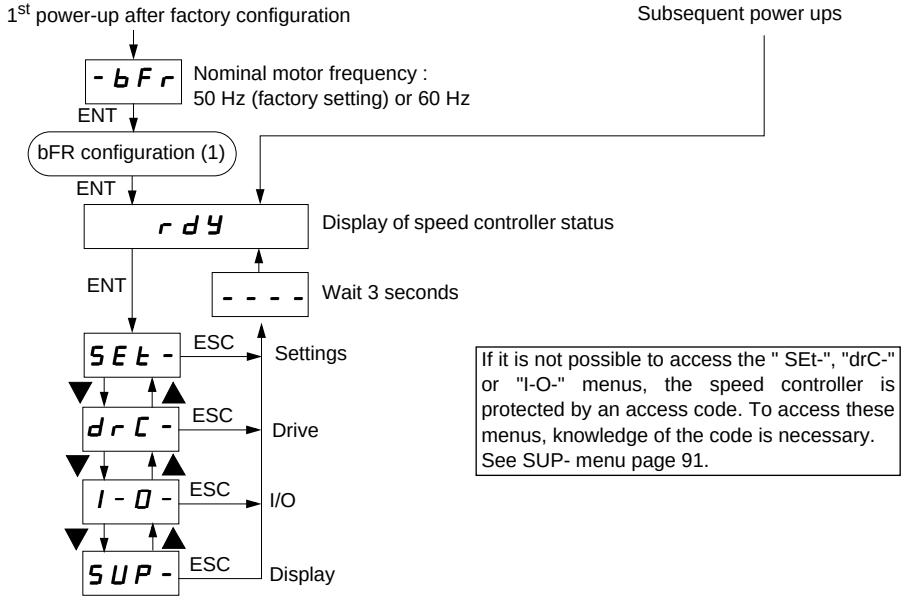
- rtrY : Automatic restart in progress

- nSt : Freewheel stop command

- FSt : Fast stop command

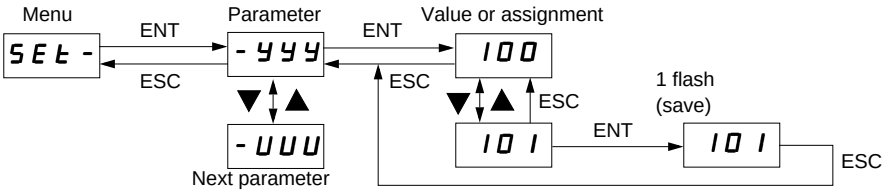
Programming

Access to menus



Access to parameters

Example :



(1) Configure bFr at the 1st power-up, using the same procedure as for the other parameters, as described above. **Caution**, bFr can only then be modified after a return to "factory settings".

Local control option

This option consists of a reference potentiometer and provides access to 2 additional buttons on the speed controller (see documentation provided with the option) :

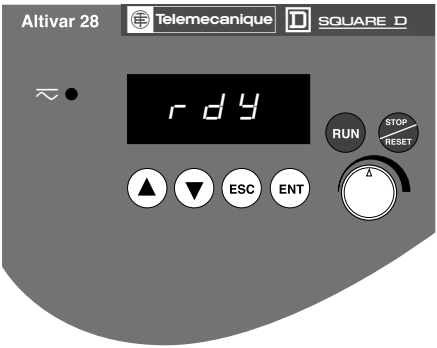
- RUN button : controls the switching on of the motor. The direction of operation is determined by parameter rOt in the settings menu SEt-.
- STOP/RESET button : controls the stopping of the motor and the clearing (resetting) of any faults The first press on the button stops the motor, and if DC injection standstill braking is configured, a second press stops this braking.

The reference given by the reference potentiometer is summed with analog input AI1.
Installing this option requires special factory setting of certain functions :

- I/O : -tCC = OPt not reassignable
  -LI1 = no not reassignable
  -LI2 = PS2 reassignable
  -LI3 = PS4 reassignable
  -LI4 = PS8 reassignable

- Drive : Atr = no, only reassignable at YES

This option cannot be removed once it has been fitted.
The option must be connected with the speed controller powered down, otherwise it will trip on an InF fault.



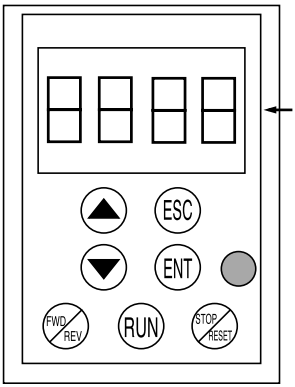
Remote Display Module Option

This module is a local control unit which can be mounted on the door of the wall mounted or floor-standing enclosure. It has a cable with connectors, which is connected to the speed controller serial link (see the manual supplied with the display module). It has the same display and the same programming buttons as the Altivar 28 with the addition of a switch to lock access to the menus and three buttons for controlling the speed controller :

- FWD/RV : reversal of the direction of rotation
- RUN : motor run command
- STOP/RESET : motor stop command or fault reset

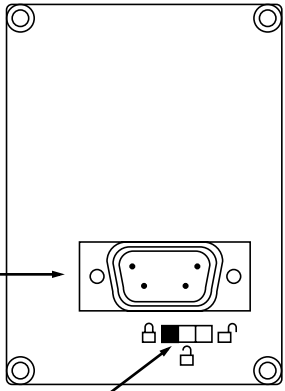
  The first press on the button stops the motor, and if DC injection standstill braking is configured, a second press stops this braking.

View of the front panel :



4-character display

View of the rear panel :



Connector

Access switch :

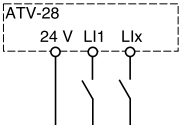
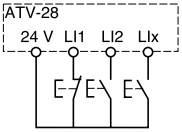
- position : settings and configuration not accessible
- position : settings accessible
- position : settings and configuration accessible

Set bdr to 19.2 (I/O menu see page 97)

Configuration

I/O assignment menu I - O -

The parameters can only be modified when the speed controller is stopped and locked.
The functions are defined in the section "Configurable I/O Application Functions".

Code	Assignment	Factory setting
- t C C	Configuration of terminal block control : 2-wire or 3-wire control. 2C = 2-wire, 3C = -wire, OPt = presence of the local control option, operation is then identical to 3-wire control. 2-wire control : The open or closed state of the input controls running or stopping. Wiring example : LI1 : forward LIX : reverse  3-wire control (pulse control) : one pulse is all that is needed to control start-up. Wiring example : LI1 : stop LI2 : forward LIx : reverse  Changing the assignment of tCC returns the logic inputs to factory setting : • tCC = 2C : LI1 : "Forward", cannot be reassigned LI2 : rrS ("Reverse") LI3 : PS2 LI4 : PS4 • tCC = 3C : LI1 : Stop, cannot be reassigned LI2 : For ("Forward"), cannot be reassigned LI3 : rrS ("Reverse") LI4 : JOG • tCC = OPt : LI1 : no, cannot be reassigned LI2 : PS2 LI3 : PS4 LI4 : PS8	2C
- L C C	Parameter only accessible with the remote display module option : no - YES Enables control of the speed controller using the STOP/RESET, RUN and FWD/REV buttons on the display module. The speed reference is then given by parameter LFr in the SEt- menu. Only the freewheel, fast stop and DC injection stop commands remain active on the terminal block. If the speed controller / display module link is broken, the speed controller locks on an SLF fault.	no

Configuration

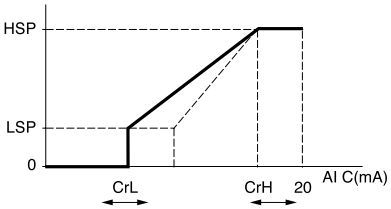
I/O assignment menu I-O- (continued)

Code	Assignment	Factory setting
-L I2 -L I3 -L I4	Logic inputs no : not assigned rrS : reverse rotation (2 operating directions) rP2 : ramp switching (1) JOG : "step by step" operation (1) PS2, PS4, PS8: See “Preset speeds”, page 68. nSt : freewheel stop. Function active when the input is powered down dCI : DC injection braking IdC, peak limited at 0.5 ItH after 5 seconds if the command is maintained FSt : fast stop. Function active when the input is powered down FLO : forced local mode rSt : fault reset rFC : reference switching: when the input is powered down the speed reference is AIC/AI2 or that generated by the PI function if it is assigned and when the input is powered up the speed reference is AI1 • If tCC = 3C, LI2 = For (forward), cannot be reassigned • If a function is already assigned to another input it still appears, but its storage using ENT is inactive • The 4 or 8 preset speeds must be configured in the following order of assignment : PS2 then PS4 then PS8. They must be cancelled in the reverse order (see Configurable I/O Application Functions)	rrS PS2 PS4
-AIC	Analog input AIC / AI2 no : not assigned. SAI : summing with AI1 PII : PI regulator feedback, the PI reference being internal adjustment parameter rPI (1) PIA : PI regulator feedback, the PI reference being automatically assigned to AI1 (1) • SAI can not be assigned if a logic input is assigned to rFC (reference switching) • PII and PIA can not be assigned if a logic input is assigned to JOG or to PS2 • If a logic input LIx is assigned to rFC (reference switching) and AIC is assigned to PII or PIA, the speed reference is taken on AI1 if LIx = 1 and is the output of PI if LIx = 0	SAI

(1) Assigning this function displays the corresponding settings in the SEt- menu so that they can be adjusted.

Configuration

I/O assignment menu [I-O] (continued)

Code	Assignment	Factory setting
-CrL -CrH	Minimum value on input AIC, adjustable from 0 to 20 mA. Maximum value on input AIC, adjustable from 0 to 20 mA. These two parameters are used to configure the input for 0-20 mA, 4-20 mA, 20-4 mA, etc. Frequency  If the input used is AI2, these parameters remain proportionally active : 4 mA ➡ 2 V 20 mA ➡ 10 V For a 0 - 10 V input, configure CrL at 0 and CrH at 20. These parameters should be adjusted when the PI function is activated.	4 mA 20 mA
-AO	Analog output no : not assigned OCr : motor current. 20 mA corresponds to twice the nominal drive current rFr : motor frequency. 20 mA corresponds to the maximum frequency tFr OLO : motor torque. 20 mA corresponds to twice the nominal motor torque OPr : power supplied by the speed controller. 20 mA corresponds to twice the nominal drive power	rFr
-AOt	Analog output 0 : 0-20 mA configuration 4 : 4-20 mA configuration	0

Configuration

I/O assignment menu I-O- (continued)

Code	Assignment	Factory setting
-r2	Relay R2 no : not assigned FtA : frequency threshold reached. The contact is closed if the motor frequency is greater than or equal to the threshold set by Ftd (1) CtA : current threshold reached. The contact is closed if the motor current is greater than or equal to the threshold set by Ctd (1) SrA : speed reference reached. The contact is closed if the motor frequency is greater than or equal to the speed reference tSA : thermal threshold reached. The contact is closed if the motor thermal state is greater than or equal to the threshold set by ttd (1)	SrA
-Add	Address of the speed controller when it is controlled via the serial link. Adjustable from 1 to 31.	1
-bdr	Serial link transmission speed : 9.6 = 9600 bits / s or 19.2 = 19200 bits / s 19200 bits/ s is the transmission speed for operating the remote display module. Modification of this parameter is only taken into account after the speed controller has been powered down then powered up.	19.2

(1) Assigning this function displays the corresponding settings in the SEt- menu so that they can be adjusted.

Configuration

Drive menu drC-

The parameters can only be modified with the speed controller stopped and locked, except for Frt, SFr, nrd and SdS, which can be adjusted with the controller running.

Drive performance can be optimized by :
- entering the values given on the rating plate
- performing an auto-tune operation (on a standard asynchronous motor)

Code	Assignment	Adjustment range	Factory setting
-UnS	Nominal motor voltage given on the motor rating plate The adjustment range depends on the speed controller model: ATV28••••M2 ATV28••••N4	 200 to 240V 380 to 500 V	 230 V 400 V if bFr = 50 460 V if bFr = 60
-FrS	Nominal motor frequency marked on the motor rating plate.	40 to 400 Hz	50 / 60Hz acc. to bFr
-tUn	Auto-tuning: optimization of the drive performance by measuring the stator resistance Only active for V/F ratios : n and nLd (Uft parameter) - no : (factory parameters of standard IEC motors) - donE (auto-tuning already done) : use the parameters of the auto-tune which has already been done - YES : starts auto-tuning When autotuning is completed, rdY is displayed. On returning to tUn, donE is displayed. If the fault tnF appears, check that the motor is connected correctly. If the connection is correct, the motor is not suitable : use the L or the P ratio (Uft parameter). Caution : Auto-tuning operation will only be performed if no command has been activated. If a "freewheel" or "fast stop" function is assigned to a logic input, this input must be set to 1 (active at 0).	no-donE-YES	no
-tFr	Maximum output frequency	40 to 400 Hz	60 / 72 Hz (1.2 x bFr)

Configuration

Drive menu dr C - (continued)

Code	Assignment	Adjustment range	Factory setting
- UFt	Selection of the type of voltage / frequency ratio - L : constant torque for motors connected in parallel or special motors - P : variable torque: pump and fan applications - n : sensorless flux vector control for constant torque applications - nLd : energy saving, for variable torque applications or constant torque applications not requiring high dynamics	L - P - n - nLd	n
- brA	Activating this function automatically adapts the deceleration ramp, if this has been set at too low a value for the inertia of the load. no : function inactive. YES : function active. The adaptation of the deceleration ramp depends on the dEC settings and the gain FLG (see SET adjust menu page 89). The function is incompatible with: • positioning on a ramp • the use of a braking resistor	no - YES	YES
- Frt	Ramp switching frequency When the output frequency becomes greater than Frt, the ramp times taken into account are AC2 and dE2. If Frt = 0, the function is inactive. This parameter does not appear if a logic input is assigned to the ramp switching function rP2.	0 to HSP	0 Hz
- SFr	Switching frequency The switching frequency can be adjusted to reduce the noise generated by the motor. Above 4 kHz, the speed controller output current must be derated : • up to 12 kHz : derated by 1.25% per kHz or 10% at 12 kHz • above 12 kHz : derated by 10% + 3.3 % per kHz or 19.9% at 15 kHz	2 to 15 kHz	4.0
- nrd	This function randomly modulates the switching frequency to reduce the motor noise. no : function inactive. YES : function active.	no - YES	YES

Parameter can be adjusted during operation.

Configuration

Drive menu dr C - (continued)

Code	Assignment	Adjustment range	Factory setting
- AtR	Automatic restart, after locking on a fault, if the fault has disappeared and the other operating conditions permit the restart. The restart is performed by a series of automatic attempts separated by increasingly longer waiting periods : 1 s, 5 s, 10 s, then 1 min for the following attempts. If the restart has not taken place after 6 min, the procedure is aborted and the speed controller remains locked until it is powered down then powered up. The following faults permit this function : OHF, OLF, USF, ObF, OSF, PHF, OPF, SLF. The speed controller fault relay remains activated if this function is active. The speed reference and the operating direction must be maintained. This function can only be used in 2-wire control (tCC = 2C). ⚠ Check that any accidental start does not present any danger to personnel or equipment. - no : Function inactive - YES : Function active - USF : Function only active for the USF fault	no - YES - USF	no
- OPL	Enables the motor phase failure fault. - no : function inactive - YES : function active (motor phase loss detection) - OAC: activation of the function manages the presence of a downstream contactor	no - YES - OAC	YES
- IPL	Enables the line supply phase failure fault. no : function inactive. YES : function active. This parameter does not exist on the ATV28HU09M2, U18M2, U29M2 and U41M2 for a single phase line supply. The fault is only detected if the motor is on-load (around 0.7 times the nominal power). At low load, single phase operation does not cause damage.	no - YES	YES
- StP	Controlled stop on loss of line supply : Controls the stopping of the motor when there is a loss of line supply, following a ramp which can be adjusted via FLG (see SET adjust menu page 89) according to the kinetic energy restored. no : function inactive. YES : function active.	no - YES	no

Drive menu dr C - (continued)

Code	Assignment	Adjustment range	Factory setting
-FLr	Enables a smooth restart (catch a spinning load) after the following events : - loss of line supply or power off - fault reset or automatic restart - freewheel stop or DC injection stop with logic input no : function inactive. YES : function active.	no - YES	no
-drn	Lowers the tripping threshold of the USF fault in order to operate on a line supply with 40% voltage drops. no : function inactive. YES : function active : ⚠ • A line choke must be used • The performance of the speed controller can no longer be guaranteed when operating at undervoltage	no - YES	no
-SdS	Scale factor for the display parameter SPd (-SUP menu), used to scale a value in proportion to the output frequency, the machine speed or the motor speed. For example : 4-pole motor, 1500 rpm at 50 Hz : -SdS = 30 -SPd =1500 at 50 Hz	1 to 200	30
-FCS	Return to factory settings (except LCC setting, see I/O menu page 79) no : no YES : the next display will be InIt then bFr (start of the menus)	no - YES	no

Parameter can be adjusted during operation.

Settings

Adjust menu SEt -

These adjustment parameters can be modified with the speed controller stopped or running. Ensure that changes made during operation do not present any danger. Changes should preferably be made with the speed controller stopped.

Code	Assignment	Adjustment range	Factory setting
-LFr	Speed reference via the display module. This parameter appears with the remote display module option if control of the speed controller via the display module is enabled : LCC parameter in I-O- menu.	LSP to HSP	
-rPI	Internal PI reference This parameter appears if analog input AIC/AI2 is assigned to the internal PI function (AIC = PII). The adjustment range of rPI is a percentage of AI max. (internal value of the frequency reference). AI max. depends on the voltage applied at AI2 or on the input current in AIC and the CrL and CrH parameter settings in the I/O menu (see page 81). To define rPI: $rPI = 100 \frac{(AIC \times FbS) - CrL}{CrH - CrL}$ with $(AIC \times FbS) \leq 10$ Example: process control with 10 mA of feedback on input AIC configured as 4 mA - 20 mA. $rPI = 100 \frac{10 - 4}{20 - 4} = 37,5$	0.0 to 100.0 %	0.0
-rOt	Direction of operation. This parameter appears if the "local control" option is present . It defines the direction of operation : - forward : For. - reverse : rrS	For - rrS	For

(1) In is the nominal speed controller current shown in the catalog and on the speed controller rating plate.

The parameters in shaded boxes appear if the corresponding functions have been configured in the drC- or I-O- menus.

Settings

Adjust menu SEt- (continued)

Code	Assignment	Adjustment range	Factory setting
-ACC -dEC	Acceleration and deceleration ramp times. Defined to range from 0 to nominal frequency bFr. Ensure that the value of dEC is not too low in relation to the load to be stopped.	0,0 to 3600 s 0.0 to 3600 s	3 s 3 s
-AC2 -dE2	2nd acceleration ramp time 2nd deceleration ramp time These parameters are accessible if the ramp switching threshold (Frt parameter in the drC- menu) is other than 0 Hz or if a logic input is assigned to ramp switching.	0,0 to 3600 s 0.0 to 3600 s	5 s 5 s
-LSP	Low speed	0 to HSP	0 Hz
-HSP	High speed : ensure that this setting is appropriate for the motor and the application.	LSP to tFr	bFr
-ItH	Current used for the motor thermal protection. Set ItH to the nominal current marked on the motor rating plate. To disable thermal protection, increase the value to the maximum (ntH displayed).	0,20 to 1,15 In (1)	In (1)
-UFr	Optimizes the torque at very low speed. Ensure that the value of UFr is not too high which will cause the motor to saturate.	0 to 100 %	20
-SLP	Adjusts the slip compensation around the value set by the nominal motor speed. This parameter only appears if parameter UFt = n in the drC- menu.	0.0 to 5.0 Hz	According to controller output

(1) In is the nominal speed controller current shown in the catalog and on the speed controller rating plate.

The parameters in shaded boxes appear if the corresponding functions have been configured in the drC- or I-O- menus.

Settings

Adjust menu SEt - (continued)

Code	Assignment	Adjustment range	Factory setting
-FLG	Frequency loop gain, acts primarily when brA=YES (see page 97) and during deceleration. Practical advice: - machines with high inertia: gradually reduce the value in the event of overvoltage faults on deceleration (OBF) - machines with fast cycles or low inertia: gradually increase the gain FLG to optimize the following of the deceleration ramp (dEC) and limit the number of overvoltage faults on deceleration (OBF) Too high a gain may result in operating instability.	0 to 100 %	33
-IdC	Level of DC injection braking current After 5 seconds the injection current is peak limited at 0.5 Ith if it is set at a higher value.	0.1 ItH to In (1)	0.7 In (1)
-tdC	DC injection standstill braking time If the time is increased to 25.5 s, "Cont" is displayed. The DC injection is then continuous at standstill.	0 to 25,4 s Cont.	0.5 s
-JPF	Skip frequency prevents prolonged operation at a frequency range of 2 Hz around JPF. This function prevents a critical speed which leads to resonance. Setting the function to 0 renders it inactive.	0 to HSP	0 Hz
-JOG	Jog operating frequency	0 to 10 Hz	10 Hz
-rPG	PI regulator proportional gain, contributes to dynamic performance during rapid changes in the PI feedback.	0,01 to 100	1
-rIG	PI regulator integral gain, contributes to the static precision during slow changes in the PI feedback.	0.01 to 100 / s	1 / s
-FbS	PI feedback multiplication coefficient	0.1 to 100	1
-PIC	Reversal of the direction of correction of the PI regulator : no : normal. YES : reverse.	no - YES	no

(1) In is the nominal speed controller current shown in the catalog and on the speed controller rating plate.

The parameters in shaded boxes appear if the corresponding functions have been configured in the drC- or I-O- menus.

Settings

Adjust menu SEt - (continued)

Code	Assignment	Adjustment range	Factory setting
- SP2	2 nd preset speed	LSP to HSP	10 Hz
- SP3	3 rd preset speed	LSP to HSP	15 Hz
- SP4	4 th preset speed	LSP to HSP	20 Hz
- SP5	5 th preset speed	LSP to HSP	25 Hz
- SP6	6 th preset speed	LSP to HSP	30 Hz
- SP7	7 th preset speed	LSP to HSP	35 Hz
- Ftd	Motor frequency threshold beyond which the contact on relay R2=FtA closes	0 to HSP	bFr
- Ctd	Current threshold beyond which the contact on relay R2=CtA closes	0,1 In to 1.5 In (1)	1.5 In (1)
- ttd	Motor thermal state threshold beyond which the contact on relay R2=tSA closes	1 to 118 %	100 %
- tLS	Low speed operating time Following operation at LSP for a defined period, a motor stop is requested automatically. The motor restarts if the frequency reference is greater than LSP and if a run command is still present. Caution : value 0 corresponds to an unlimited period.	0 to 25.5 s	0 (no time limit)

(1) In is the nominal speed controller current shown in the catalog and on the speed controller rating plate.

The parameters in shaded boxes appear if the corresponding functions have been configured in the drC- or I-O- menus.

Settings

Display menu SUP- (choice of parameter to be displayed during operation, view the last fault, speed controller software version and access code)

The display chosen is saved by :
- Pressing the ENT key once: the choice is temporary, it will be cleared at the next power up.
- Pressing the ENT key twice : the choice is permanent. The second press on ENT exits the SUP- menu.

The following parameters can be accessed, with the speed controller stopped or running.

Code	Parameter	Unit
-FrH	Display the frequency reference	Hz
-rFr	Display the output frequency applied to the motor	Hz
-SPd	Display the value calculated by the speed controller (rFr x SdS)	–
-LCr	Display the motor current	A
-OPr	Display the power supplied by the motor, estimated by the speed controller. 100 % corresponds to the nominal speed controller power.	%
-ULn	Display the line voltage	V
-tHr	Display the motor thermal state : 100% corresponds to the nominal thermal state. Above 118%, the speed controller triggers an OLF fault (motor overload).	%
-tHd	Display the speed controller thermal state : 100% corresponds to the nominal thermal state. Above 118%, the speed controller triggers an OHF fault (drive overheated). It can be reset below 70%.	%
-LFt	View the last fault which appeared. If there has been no fault, the display shows : noF.	–
-CPU	Speed controller software version	–
-COd	Access code : 0 to 9999. Value 0 (factory setting) does not prevent access. All other values lock access to the SEt-, drC- and I-O- menus. To lock access to the speed controller, the code can be incremented using (▲ ▼) then saved using (ENT). ⚠ **• Do not forget to make a note of the code, as once it has been saved, it is no longer displayed.** To access the menus on a speed controller which is locked by a code, the code can be incremented using (▲ ▼) and confirmed with (ENT) : • If the correct access code is displayed, it flashes, and code 0 can then be configured in order to access the menus. • If an incorrect code is displayed, the speed controller returns to the initial display (rdY).	

Settings

Display menu SUP - (continued)

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Code	Parameter
- - - -	Display of speed controller status : the operating phase of the motor or a fault. - Init : Initialization sequence - rdY : Speed controller ready - 43.0 : Display of the frequency reference - dcb : DC injection braking in progress - rtrY : Automatic restart in progress - nSt : Freewheel stop command - FSt : Fast stop command. - mEmO: Save parameter

Maintenance

Servicing

The Altivar 28 does not require any preventative maintenance. It is nevertheless advisable to carry out the following operations regularly :

- Check the condition and tightness of connections
- Check that the temperature around the unit remains at an acceptable level and that the ventilation is effective (average service life of fans : 3 to 5 years depending on operating conditions)
- Remove any dust from the speed controller

Assistance with maintenance

If there is a problem when starting up or during operation, firstly check that the recommendations relating to the environment, mounting and connections have been followed.

The first fault detected is memorized and displayed on the screen : the speed controller locks and fault relay R1 is tripped.

Clearing faults

Switch off the speed controller power supply in the event of a fault which cannot be reset.
Wait for the LED and the display to go off completely.
Find the cause of the fault in order to correct it.
Restore the power supply : this will clear the fault if it has disappeared.

In some cases there may be an automatic restart after the fault has disappeared if this function has been programmed (see Atr menu drC page 85).

Display menu

This is used to prevent and find the causes of faults by displaying the speed controller status and its current values.

Spares and repairs

Consult Schneider Electric product support.

Faults - Causes - Remedies

Speed controller does not start, no fault displayed

• The assignment of the "Fast stop" or "Freewheel stop" functions will prevent the controller from starting if the corresponding logic inputs are not powered up. The ATV-28 then displays "nSt" in freewheel stop mode and "FSt" in fast stop mode. This is normal since these functions are active at zero so that the controller will be stopped safely if there is a wire break.
• On power-up or a manual fault reset or after a stop command, the motor can only be powered once the "forward", "reverse" and "DC injection stop" commands have been reset. If they have not been reset, the speed controller will display "rdY" but will not start. If the automatic restart function is configured (parameter Atr in the drC menu), these commands are taken into account without a reset being necessary.

Faults which cannot be reset automatically

The cause of the fault must be corrected before resetting by powering down and then powering up.

Fault	Probable cause	Remedy
- OCF overcurrent	- ramp too short - inertia or load too high - mechanical blocking - motor phase short-circuit	- Check the settings - Check the motor/speed controller/load sizing - Check the state of the mechanism - Check the cables connecting the drive to the motor
- SCF motor short-circuit	- short-circuit or earthing at the speed controller output - significant earth leakage current at the drive output if several motors are connected in parallel	- Check the cables connecting the speed controller to the motor, and the insulation of the motor - Adjust the switching frequency - Add motor chokes
- InF internal fault	- internal fault	- Check the environment (electromagnetic compatibility) - Check that the "local control" option has not been connected or disconnected with the controller powered up - Send the speed controller to be checked/repaired
- tnF auto-tuning fault	- special motor or motor whose power is not suitable for the speed controller - motor not connected to the drive	- Use the L or the P ratio - Check the presence of the motor during auto-tuning - If a downstream contactor is being used, close it during auto-tuning
- EEF internal fault (EEPROM)	- internal fault	- Send the speed controller to be checked/repaired - Polluted environment, ensure the installation guidelines contained in the manuals have been respected

Faults - Causes - Remedies

Faults which can be reset with the automatic restart function, after the cause has disappeared

Fault	Probable cause	Remedy
- OHF speed controller overload	- I^2t too high: > 1.85 In drv - 2 s > 1.50 In drv - 60 s - speed controller temperature too high	- Check the motor load - Check the drive ventilation and the environment Wait for the controller to cool before restarting
- OLF motor overload	- tripped by I^2t motor being too high	- Check the setting of the motor thermal protection, check the motor load. Wait for the controller to cool before restarting
- OSF overvoltage	- line voltage too high - disturbed line supply	- Check the line voltage
- USF undervoltage	- line supply too low - transient voltage dip - damaged load resistor	- Check the voltage and the voltage parameter - Reset - Send the speed controller to be checked/repaired
- ObF overvoltage during operation or deceleration	- braking too sudden or driving load - line voltage too high - disturbed line supply	- Increase the deceleration time - Install a braking resistor if necessary - Activate the brA function if it is compatible with the application - Reduce the frequency loop gain FLG if brA is active - Check the line voltage
- PHF phase failure under load conditions	- speed controller incorrectly supplied or a fuse blown - transient phase fault - 3-phase ATV28 used on a single phase line supply - supply transformer too small - mains ripple - load instability	- Check the power connection and the fuses - Reset - Use a 3-phase line supply - Check the supply transformer power - Adjust the voltage loop gain UFr

Faults - Causes - Remedies

Fault	Probable cause	Remedy
-OPF motor phase failure	- loss of a phase at the speed controller output	- Check the connections from the speed controller to the motor
	- downstream contactor open	- If a downstream contactor is being used, set OPL to OAC
	- motor not connected or motor power too low	- Test on a low power motor or without a motor: In factory settings mode, motor phase loss detection is active (OPL = YES). To check the drive in a test or maintenance environment without having to switch to a motor with the same rating as the drive (particularly useful in the case of high power drives), deactivate motor phase loss detection (OPL = no)
	- instantaneous instability in the motor current	- Optimize the drive settings via Ith, UnS, UFr and auto-tuning
-SLF serial link failure	- incorrect connection on the speed controller connector	- Check the serial link connection on the speed controller connector
	- disconnection of communication in local control mode	- Restore the connection

Malfunction with no fault display

Display	Probable cause	Remedy
No code, LED not illuminated	- no power supply	- Check power supply to drive
- rdy red LED lit	- an LI input is assigned to "freewheel stop" or "fast stop" and this input is not switched on. These stops are controlled by loss of the input	- Connect the input to 24 V to disable the stop
-rdy or nSt non-following of deceleration ramp	- high inertia or driving load	- Reset DEC and FLG

Configuration/Settings Tables

Speed controller ATV-28 : .....
Optional customer identification no. : .....
Software version (CPU parameter in the SUP menu) : .....
Optional access code : .....
Local control option no ☐ yes ☐

Menu I-O (inputs/outputs)

Code	Factory setting	Customer setting	Code	Factory setting	Customer setting
-tCC	2C		-LI2	rrS	
-LI3	PS2		-LI4	PS4	
-AIC	SAI		-CrL	4 mA	mA
-CrH	20 mA	mA	-AO	rFr	
-AOt	0 mA	mA	-r2	SrA	
-Add	1		-bdr	19.2	

Menu drC- (drive)

Code	Factory setting	Customer setting	Code	Factory setting	Customer setting
-UnS	V	V	-FrS	Hz	Hz
-tUn	no		-tFr	Hz	Hz
-UFt	n		-brA	YES	
-Frt	0 Hz	Hz	-SFr	4.0 kHz	kHz
-nrd	YES		-Atr	no	
-OPL	YES		-IPL	YES	
-StP	no		-FLr	no	
-drn	no		-Sd5	30	

Configuration/Settings Tables

Menu SEt - (settings)

Code	Factory setting		Customer setting	Code	Factory setting		Customer setting
-rPI	0.0	%	Control	-rOt	For		Control
-ACC	3.0	s	s	-dEC	3.0	s	s
-AC2	5.0	s	s	-dE2	5.0	s	s
-LSP	0.0	Hz	Hz	-HSP		Hz	Hz
-ItH		A	A	-UFr	20	%	%
-SLP		Hz	Hz	-FLG	33	%	%
-IdC		A	A	-tdC	0.5	s	s
-JPF	0	Hz	Hz	-JOG	10	Hz	Hz
-rPG	1			-r IG	1	/s	/s
-FbS	1			-P IC	no		
-SP2	10	Hz	Hz	-SP3	15	Hz	Hz
-SP4	20	Hz	Hz	-SP5	25	Hz	Hz
-SP6	30	Hz	Hz	-SP7	35	Hz	Hz
-Ftd		Hz	Hz	-Ctd		A	A
-ttd	100	%	%	-tLS	0.0	s	s

The parameters in shaded boxes appear if the corresponding functions have been configured in the drC- or I-O- menus.

Note

Note

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SC DOC 293-VVD

2002.10